The Journal of

Applied Psychology

Vol. III MARCH, 1919 No. 1

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L. R. GEISSLER

And a Board of Co-operating Editors

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The Journal of Applied Psychology

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Communications and manuscripts may be sent to any one of the three editors; reviews, summaries, notices, books and off-prints for review should be addressed to Dr. L. R. Geissler, Clark University, Worcester, Mass. Contributors are requested to follow the conventional method of citation employed by this JOURNAL; in every case the year, volume and pages should be specified.

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In Memoriam

In the untimely death of Professor JOHN WALLACE BAIRD, of Clark University, the *Journal of Applied Psychology* has lost one of its founders and ardent supporters. Exhausting his energies in applying the facts of psychology to the task of rehabilitating the crippled soldiers returned from France for treatment at the Walter Reed Hospital, Professor Baird's already impaired health broke down so completely that the best medical skill at the Johns Hopkins Hospital could do no more than temporarily relieve the intense suffering and pain which he bore with heroic patience, cheerfully and without complaint to the last. He died on the evening of February 2nd in Baltimore and was buried in the town of his birth, St. Mary's, Ontario, Canada.

Born on the 21st of May, 1869, he studied at the Universities of Toronto, Leipzig, Wisconsin, and Cornell. At the last-mentioned institution he received the degree of Ph.D. in 1902 and served as assistant in psychology and later as Carnegie Research Assistant until 1904, when he was called to Johns Hopkins University as instructor. In 1906 he entered the teaching staff of the University of Illinois, and in

February, 1910, he came to Clark University to take charge of the psychological laboratory. He has conducted and supervised many important experimental investigations, especially in the field of the higher mental functions, such as memory and the thought-processes. The concrete problems involved in these subjects aroused in him a strong interest in the applications of psychology, as is shown not only in such studies as the legibility of printers' type and memory for absolute pitch, but also in his enthusiastic efforts in helping to launch the publication of the *Journal of Applied Psychology*. When finally the opportunity presented itself to make use of psychological principles in rehabilitating wounded soldiers and helping them to regain control over their crippled bodies, he applied himself to this task with an untiring devotion and self-renunciation until his own strength was exhausted.

His deep scholarship is recognized by colleagues and associates in requesting his services on many important missions and in his election to the presidency of the American Psychological Association. He was loyal to his friends and deeply devoted to his family, and all who came in contact with him will remember him as a true gentleman.

THE
JOURNAL OF APPLIED PSYCHOLOGY

VOL. III MARCH, 1919 No. 1

ARMY PERSONNEL WORK.

WITH SOME IMPLICATIONS FOR EDUCATION AND INDUSTRY.

By Lieutenant Colonel W. V. BINGHAM, Carnegie Institute of Technology.
(Formerly Executive Secretary of the Committee on Classification of personnel in the Army)

Every practical problem of personnel in war, industry, business or education presents at least three phases; first, study of the job, that is, determination of the duties to be performed and specification of the qualifications necessary to perform those duties; second, inventory of the individual man to ascertain and record his qualifications; third, placement of the man in the job. In the Army this implies a system of personnel classification, a routine for making accurate requisitions, a procedure for locating quickly the specified personnel, and a machinery for effecting its assignment or transfer to the post where it is most needed.

It is the contention of the writer that the most fundamental phase of personnel work and yet the most neglected, is the first mentioned; namely, analysis and precise definition of duties and qualifications.

Consider that almost every company in the Signal Corps and the Air Service has one or more so-called "Master Signal Electricians." If a number of soldiers had to be trained to fill these various posts within a few weeks, what sort of recruits would you select for training? You would be at a loss until you knew the duties. In an Outpost Company of a Field Signal Battalion, a Master Signal Electrician is "responsible for the installation, maintenance and operation of small telephone offices, and for the proper functioning of

electrical apparatus such as buzzer-phones and short range radio apparatus." But in each Pigeon Company of 324 men there are also two Master Signal Electricians; one is " in charge of the training and instruction of the men as pigeoneers and is responsible for the care and condition of the pigeons." The other, " as loft master, is in charge of the breeding loft and the 90 mobile lofts, and is responsible for the proper movement of the latter. He calculates the needs of the lofts both as to pigeons and as to supplies." In the Telegraph Company you want neither a wire chief nor a racing pigeon fancier, but a telegraph engineer to " make studies and survey routes for construction of permanent telephone or telegraph lines;—and specify layout of telephone and telegraph offices and power plant for common battery telephone switchboards." The Supply Section of an Aero Supply Squadron requires as its Master Signal Electrician an airplane mechanic; other companies need a tinsmith, a coppersmith, an armorer, a toolmaker, a master painter, an instrument repairman, a construction foreman, a storage battery electrician, a truckmaster, all masquerading with the title, grade and pay of Master Signal Electrician. In the Fabric Workers Company this particular soldier must be a tailor, for his duties are " to supervise repairs and replacements to coverings for wings, fuselage and tail surface (in linen covered sections.)

Another common grade in the Army is that of " Wagoner." In some types of units the wagoners are the soldiers who have to repair the wagons, while in other units they are mere wagon drivers, and in still others they must drive automobiles. The " horseshoer " sometimes shoes horses, but in a motorized regiments the soldier with that title repairs the motor trucks. One hesitates to make any assignments of skilled personnel in default of some definition of duties. But when you have secured a statement of just what the soldier or officer has to do, you have taken a long stride toward judicious placement and training. Without such a definition you know neither whom to choose nor how to train, and gross wastage of precious time, money and life goes on with an extravagance approximated only by the blithe wastefulness of college class rooms.

When the mobilization of the National Army began in September 1917, and the nation poured into the cantonments its human wealth of trained artisans, teachers, business and professional men, laborers, farmers and shop hands, many of them illiterate or non-English speaking, the newly appointed Personnel Officers had extremely little information to guide

them in making judicious assignments of such varied skill and talent. The preparation of this information has demanded an exhaustive study of the entire Army organization to determine where ability of various kinds is required. Its effective utilization has necessitated the development and supervision of an Army personnel system to discover the occupational, educational and military qualifications possessed by the recruits and to insure their assignment to the proper units.

These tasks were assigned to the Committee on Classification of Personnel in the Army, created by Secretary Baker on August 5, 1917, as an instrument to increase the value of the Army's man-power through securing the most effective placement of each man.[1]

For this program an initial appropriation of $25,000.00 was made, and as the scope of the Committee's responsibilities grew, additional appropriations were approved until the total amounted to $851,650.00.

While it happened that the original membership of the Committee consisted almost wholly of psychologists, many industrial and business specialists in employing, classifying and assigning men were called upon to insure the successful prosecution of the work. This has included the following activities:

1. *Classification and Placement of Enlisted Men:*

   Personnel offices have been establishd in all Army divisions, depot and training camps, coast defense stations, aviation fields, special training camps for Staff Corps and at other Army Posts. In these offices a special card system furnished accessible information as to the educational, occupational, and military qualifications of every man. With a minimum of clerical work this system selected 973,858 men for transfer largely into technical units in the Engineers, Aviation, Ordnance and other Staff Corps, and even more men for transfer within the divisions or camps. Sixteen civilian supervisors, directed by

[1] The Committee was organized with Walter Dill Scott as Director, E. L. Thorndike as Chairman, and the writer as Executive Secretary. The other members were J. R. Angell, R. C. Clothier, Raymond Dodge, H. L. Gardner, J. F. Shepard, E. K. Strong, Jr., L. M. Terman, J. B. Watson, and R. M. Yerkes. The places of five of these original members have since been filled by J. J. Coss, W. R. DeField, W. B. Hale, Winslow Russell, P. J. Reilly and J. J. Swan. A large force of able, devoted civilian and military associates of the Committee, in Washington, in the camps, and overseas, has made possible the realization of its plans.

the Committee, acted in an organizing and supervisory capacity in the field. Approximately 450 officers and 7,000 men were engaged in this personnel work. The number of soldiers interviewed by trained examiners and classified according to their best Army usefulness was in all, approximately three and a half million men.

2. *The Allotment Branch or Central Clearing Office*

of the Committee in Washington received reports on the numbers of skilled tradesmen found in each contingent of the draft, received and consolidated requisitions from the Staff Corps for specialists, and prorated these requisitions among the various camps according to their supply of necessary skilled men. On November 11, requisitions for roughly 600,000 men of designated qualifications had been filled here. Information was available at any moment for the Operations Division of the General Staff concerning the occupational qualifications of all the men in the several depot brigades, Army vocational schools, and similar sources of supply.

3. *Trade Specifications and Index of Occupations:*

Definitions of the many hundred different trades needed in our military establishment were prepared after exhaustive study, and were brought together in a book, "Army Trade Specifications." This index is an indispensable reference for Staff Corps and camp personnel officers in securing the skilled personnel needed.

4. *Tables of Occupational Needs and Personnel Specifications:*

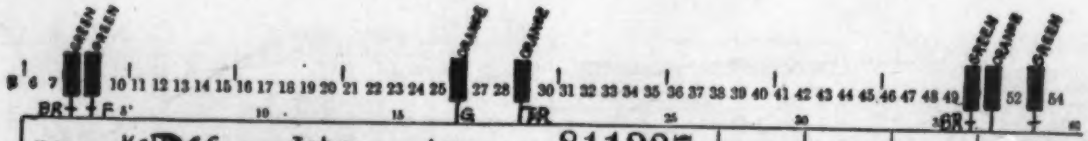
Tables were prepared showing in detail the needs for skilled workers in each sort of platoon, company, regiment or other unit. These tables were studied, criticised, and approved by Army units at the front in France, and later formed the basis for organizing quickly the newest divisions. Out of these Occupational Tables have developed the Personnel Specifications which have now been completed for the enlisted personnel of four hundred different kinds of organizations.

5. *Trade Tests:*

To increase the accuracy of selecting skilled workers among the enlisted men, a system of practical trade tests was devised, standardized and installed in twenty camps. At the time of the armistice about 130,000 men who claimed occupational skill had been trade tested.

5

ARMY PERSONNEL WORK



SOLDIERS' QUALIFICATION CARD

Name (Print clearly) Kellogg (Last name) John (First name) Lee (Middle name) 811227 (Number) W (Race)

Main Occupation: Timber & Concrete Foreman — Yrs. at it: 3½ — Wkly. wage: $ 45

Just what did you do? Boss heavy timber work and concrete construction, bridges, mills warehouses etc. — Symbol: 508R A, 80C (3) — Surgeon's O. K.: ✓

Firm worked for? A. J. Smith Construction Co.

Address of Firm? 528 - 11th St, Chicago

Dept., Shop, or Branch: Denver — Kind of Business: Gen. Construction

2d Best Occupation: Timber and Concrete Carpenter — Yrs. at it: 4 — Wkly. wage: $ 33

Just what did you do? All round experience as carpenter on rough construction & Concrete forms bridges, mills, warehouses, etc. — Symbol: 68R A, 80C (3) — Surgeon's O. K.: No.

3d Best Occupation: Tracer (draftsman) — Yrs. at it: 1½ — Wkly. wage: $ 15

Just what did you do? Traced plans - mainly floor plans building construction — Symbol: 27-7R (A) — Surgeon's O. K.: ✓

Additional Occup'ns, hobbies, etc.: 2 yrs. as general helper to Bricklayer Can mix mortar & lay brick, 166-A

Form SCP 1 11-1-18

Actual size of card

Army Specialty: — Limited Service: Limited Service

Assigned by Personnel Officer as: Bridge Carpenter — Final Physical Classification: C-2 — Preferred: ✓

Age now: 30 — Married? M - 3 — Non-E: — Illiterate: — Intelligence: A — SD:

Age at end of Schooling: 19 — Height: 5-10 — Weight: 185 — Date of Interview: MAR 12 1918

TRADE TEST RATINGS

Symbol	Rating	Symbol	Rating	Symbol	Rating	Symbol	Rating
1 8-8R	E	3 26-6	A	5		7	
2 8-6	J	4		6		8	

Greatest Authority or Leadership: Boss, construction work, 50 men, 3½ yrs.

PRESENT ASSIGNMENT AND FUTURE CHANGES

	Company	Organization	Divn. or Corps	Date
1		Comp Hq.	Q.M.	MAR 12 1918
2				
3				
4				
5				

SCHOOLING	No. of Yrs.	Graduated Yes	No
Common School	8	✓	
High School	4	51 g ✓	
College or University		51 g	
Technical College		51 g	
Trade, Night, or Business School	1		

ABILITY TO CONVERSE IN:—

	French 52	German 53	Name other language 54
Fairly Well	—		—
Fluently	—	✓	

Institution — Subject of Specialization

Trade, Night, or Business School: Y.M.C.A. Drafting

Army Schools at	No. wks.	Course	A J
1			
2			
3			

Previous Military Experience: Rank; Years of Service; Organization: Corp. 1 yr. Illinois National Guard.

Branch of Service or Special Duty Preferred: Engineers

Religious Preference? Presbyterian

Member of What Fraternal, etc., Organizations? (Answer requested but not required) Elks, Carpenters Union

Talent for Furnishing Public Entertainment: Play guitar

ARMY SPECIALTIES (For Overseas Use Only)

1 Sapper	10 Rifle Grenadier	19 Ammunition Cannoneer
2 Pioneer	11 Rifleman	20 Gun Cannoneer
3 Stokes Mortar	12 Automatic Rifleman	21 Driver
4 1-pounder	13 Company Clerk	22 Instru. Man (Artillery)
5 Telephone	14 Runner	23 Agent of Communication (Artillery)
6 Radio	15 Machine Gunner	
7 Visual Signalman	16 Horseshoer	24 Lithographer
8 Wagoner	17 Packer	25 Powderman
9 Hand Bomber	18 Gunner (Artillery)	26 Rigger

34 actual size of card

Birthplace of father (Give City and State if U. S. or Province and Name of Foreign Country) Lee, Mass.; of mother London, England

of soldier Chicago, Ill. How long in U. S. — yrs.

Citizen ☑ Taken out first papers ☐ Non-citizen ☐

From Local Board 17 (No.) Chicago (Town, City or County:) Ill. (State)

No. 383 Red ink No. 183 Date of (Induction) MAR 9 1918

PHYSICAL FINDINGS	Date	SUBSEQUENT CHANGES
1. Genito-Urinary		
2. Orthopedic 2nd degree flat feet		
3. Medical Mitral regurgitation, mild, compensated		
4. Surgical		
5. Nervous and Mental		
6. Eye R 20/40 L 20/200 Cor R 20/40 L 20/40		
7. Ear		
8. Nose and Throat		
9. Teeth		
10. Convalescent from		
11. Remarks Was as foreman, similar work, not as workman.		Preliminary Physical Classification

REMARKS

Signature of soldier John L Kellogg

Name of Camp GRANT Initials of Interviewer A.G.S.

6

BINGHAM

6. *Personnel Work for Officers:*

Qualification Cards for officers, furnishing a record of occupational, educational and military experience and a rating by superior officers, were developed and put into use throughout the Army. These cards are filed in Washington, and duplicates filed in the custody of the Division Commanders for their own use in assigning their officers.

7. *Rating of Officers:*

A uniform system of rating officers was developed. This rating system was first installed in the Officers' Training Camps as an aid in selecting candidates for commissions. Later it was used in selecting candidates for Officers' Training Schools. Now its use is universal both in America and in France as a means of securing every three months, a rating on every officer as an aid in determining promotion, demotion, discharge, and appointments to the Officers' Reserve Corps.

8. *Commissioned Personnel Specifications:*

Definitions of duties and qualifications of no less than 500 different kinds of officers in the various arms and branches of the service have been prepared, after ascertaining the answer to the question, "Just what does he do?" These commissioned personnel specifications are for use in recruiting officer material, in selecting men for training as officers, and making assignments. Statistical studies have been made of the relative significance of age, education, civilian earnings, intelligence and other qualifications of officers in the different branches of the service.

9. *Cooperation with the Air Service:*

The methods of selecting aviators were investigated and checked by reference to the actual success or failure of the pilots. An improved system of tests for aviation candidates was introduced and a new program of examination and selection installed.

10. *Cooperation with the Provost Marshal General's Office:*

Plans for securing classificatory information regarding all registrants were submitted to the Provost Marshal General and were partially embodied in the draft questionnaire.

11. *Development Battalions:*

The Committee cooperated closely with the General Staff and the Surgeon General's Office in preparing and introducing the plans for segregating, sorting, training, and utilizing the partially fit.

12. *Cooperation with the Surgeon General's Office:*

Some assistance was given to the Psychology Section of the Surgeon General's Department in devising and administering the intelligence tests for enlisted men and officers. The psychologists in turn have tested 1,716,000 soldiers and furnished the personnel officers with their intelligence ratings to assist in making assignments, balancing units, and selecting men for special responsibilities.

13. *Cooperation with the Navy:*

At the time of the armistice, representatives of this Committee were assisting the Navy and the Marine Corps to prepare and install a complete personnel classification program to correspond with the Army system. In addition, one member of the Committee has done valuable work in refining methods of selecting and training men for special duties in the Navy, such as the work of the fire-control squad, the gun-pointer, the hydrophone listener, and the lookout.

14. *The War Service Exchange:*

This branch of the Committee was established January 18, 1918, to receive and classify applications of persons desiring to serve the Government and to refer them to the branches of the service needing them, and to cooperate with other agencies in locating and supplying men needed for special purposes by the various branches of the service. This organization relieved high officials of the War Department of the necessity of devoting valuable time to the interviewing of the many influential men who came to Washington to offer their services to the Government. It also cared for a total of about one hundred and ten thousand written proffers of service. It placed approximately ten thousand men, including many of superior attainments.

15. *Personnel Work in the American Expeditionary Forces:*

Members of the Committee studied the personnel needs of the A. E. F., and, with the cordial approval of General

Pershing, established there a personnel organization similar to that in America. The Officers' Qualification Cards have had their widest usefulness over-seas, in supplying replacements and in locating rare specialists in emergencies.

16. *British Experience:*

Detailed study was made of the working of the British personnel organization, which in some respects is far superior to ours. Special reports and exhibits obtained in London from the British War Office, covered their whole program of recruitment, classification, trade-testing, assignment and transfer; industrial furloughs; weekly consolidation and analysis of strength reports; and plans for demobilization.

This in outline is a picture of the personnel work, begun in the National Army cantonments with the arrival of the first trainloads of drafted men. Neither the civilians nor the Army Officers who initiated this development dreamed of the scope it would so rapidly assume or the share it would have in effecting the speedy organization of a well balanced Army, trained and ready for the critical hour in France.

The Committee on Classification of Personnel in the Army as such has disappeared. After fourteen months of service under the Adjutant General it was transferred to the General Staff and merged with the Central Personnel Branch, newly created to supervise the procurement, placement, transfer and promotion of officers throughout all branches of the Army. This means that centralized control of personnel work for both officers and soldiers is recognized and thoroughly established as an integral part of the United States Army organization.

Among the legacies left to the Army by the Committee, such as the qualification card, the index of occupations, the trade specifications and the standardized trade tests, not the least significant is the concept of personnel specifications with all that that term implies regarding analysis and definition of duties and formulation of requirements as to the physical, intellectual, educational, technical and personal qualifications required for the performance of those duties.

The concept of personnel specifications is quite as significant for industry and education as it is for war. The college student pursuing an electrical engineering course or a course in interior decoration, or the young woman who aims to be a

secretary or a social worker or a teacher of the arts and crafts, needs a clear definition of precisely the duties for which he or she is being trained.

Let the student have before him a full and explicit description of the *duties* of the job he must be able to hold down after graduation, and of the *qualifications* in the form of particular sorts of skill, technical knowledge, general abilities and personal traits which he must possess if he is going to make a success of that job. Let each instructor be in a position to speak with authority when challenged to justify every task he assigns as contributing directly to the development of one or more of these essential qualifications.

Let the factory foreman and the employment manager crystalize their formulations of the precise duties and requisite qualifications for every post. They will clear the way for a program of intelligent hiring, judicious placement, effective training, steady promotion and just remuneration.

SAMPLE PERSONNEL SPECIFICATIONS

HEADQUARTERS AND SUPPLY COMPANY

ANTI-AIRCRAFT SECTOR (ARMY ARTILLERY)

Army title set in bold face type followed on the same line by the corresponding civilian occupation, the number of men, the degree of skill and the occupational symbol.
On the next line appears the suggested substitute occupation.
Then follows the description of army duties.

2 Sergeants Major, Junior Grade:

1 Battalion Sergeant Major. Clerical worker, general — 1 Jour. 38g
Substitute: Clerk, railroad.

Chief clerk of sector office. Under direction of Adjutant, supervises the preparation and filing of reports, returns, correspondence, orders, and bulletins.

1 Supply Sergeant Major.....Stockkeeper — 1 Jour. 18s
Substitute: Merchant.

Calculates the needs of the sector in quartermaster, signal, engineer, and ordnance property; requisitions and issues same, including daily allowance of food and fuel, to the batteries; keeps property accounts with supply depots and batteries.

1 First Sergeant: Foreman with qualities of leadership and mechanical ability..... — 1 Uncl.

Agent of company commander in maintaining discipline; manages company under direction of company commander, arranging details in execution of orders and assigning men to various employments; required to act on own initiative in emergencies in absence of company officers; supervises the preparation of company reports, returns, and correspondence.

1 Electrician Sergeant, First Class..Electrician, general — 1 Jour. 10g
Substitute: Telephone troubleman, outside.

Has charge of communications system of the sector, exclusive of wireless. Maintains and repairs telephone system, locating "troubles" and supervising the work of wiremen and repairmen. Maintains other electrical equipment of sector, including searchlights.

1 Assistant Engineer...Gasoline engineman, stationary — 1 Jour.25s
Substitute: Auto repairman, general.

Has charge of power-generator system, gasoline engines, and motor transportation of the sector, directing the repairs necessary to their proper maintenance.

1 Radio Sergeant.....Wireless constructor — 1 Jour. 31wc
Substitute: Wireless operator.

Has charge of the wireless apparatus of the sector; constructing, maintaining and supervising the operations of the radio system, and the instruction of radio operators in the operation, care, and repair of wireless instruments and equipment.

SAMPLE PERSONNEL SPECIFICATION
(OFFICERS)

Name of Corps or Arm: Coast Artillery Corps

Subdivision or Organization: Battery, Motorized Gun or Howitzer

Official Designation and Rank of Officer: Battery Commander, Captain

I. Description of Duties.

Commands 4 lieutenants and 219 to 278 men. Responsible for preparation of company reports and records; for the proper equipment of his command and for the messing of the personnel. Responsible for property of the battery; guns or howitzers, motor trucks and tractors; infantry equipment of each soldier and other company supplies.

Responsible for the training and discipline of officers and men as soldiers and their instruction in loading and firing of guns or howitzers, machine guns and small arms and their proper care; in motor transportation, observation, signalling and telephonic communication; in earthwork construction, in gas defense, and in camouflage.

Responsible for the tactical movement of his battery (men, guns and equipment); tactical preparation of position for guns; orientation (by means of surveying); calculation of firing data (involving use of trigonometry and logarithms) and correction of data when firing and under fire.

When battery operates independently will assume duties of Major, requiring tactical judgment in reconnaisance, and initiative in direction and supervision of fire.

II. SPECIAL TECHNICAL QUALIFICATIONS.

Required: Working knowledge of mathematics through trigonometry and logarithms.

Desired: Knowledge of mechanics, electricity, and motor transportation.

III. FIRST CHOICE OF CIVILIAN OCCUPATION.

	Years of Experience
Civil Engineer	3—5

IV. OTHER CHOICES OF CIVILIAN OCCUPATION.

	Years of Experience
Electrical or mechanical engineer	3—5
Graduate of recognized technical school with business or professional experience	3—5
College graduate with business or professional experience	3—5

V. STAFF CORPS SCHOOL.

Will be required to attend school for three months.

VI. AGE LIMITS.

Possible Age Limit 25-45 years.
Best Age Limit 30-40 years.

VII. PHYSICAL REQUIREMENTS.

Officer must be qualified for full military service.

VIII. MINIMUM SCHOOLING.

Two years of college.

A STANDARDIZED GROUP EXAMINATION OF INTELLIGENCE INDEPENDENT OF LANGUAGE

By Edward L. Thorndike, Teachers College, Columbia University

I. Description of the Tests

The practicability of having one examiner measure the intelligence of a large group of persons at one time has been fully demonstrated by four years' experience of the Metropolitan Life Insurance Company with a test devised by the writer, by the work of McCall for the New York State Ventilation Commission, and lately on an extraordinarily wide scale by the experience of the United States Army with the admirable examinations devised by the Psychology Committee of the National Research Council.

Such group examinations reduce expense, increase uniformity of procedure, and, if extensive enough, give a more accurate determination of intellect than would be obtained by an hour's interview by the average of the most competent third of physicians, teachers or psychologists. They cannot, of course, do the work of a specially talented diagnostician of intellect, who adapts his examination to the peculiarities of each case and sees the bearings of minute features of each response. But not over one in ten of physicians, teachers and psychologists would claim such special talents. They cannot detect malingering or suggest the causes of the degree of dullness found. They are therefore only accessory features of a general mental examination, inventory, and diagnosis. But where the persons examined are doing their best to score well, and in so far as the question is simply "How intelligent is this man or boy?" they are, if well devised, substantially adequate. And where large numbers are to be examined, they are a useful first step in a general mental examination, inventory and diagnosis.

The first forms of group examinations of intelligence consisted chiefly of intellectual tasks with words and numbers and presupposed a considerable ability to read. They were thus unavailable for use with foreigners and illiterates, were unfair to those of limited opportunity to learn to read well, and in all cases measured intelligence with words and

numbers to the relative exclusion of intelligence in dealing with things and people.

The psychologists in the army therefore made up from the various non-verbal tests which had been devised and experimented with, by Norsworthy, Knox, Porteus, Dearborn, Kelley, Pintner and Patterson and others, a composite examination, the directions for which could be given by gesture and the execution of which required no acquaintance with spoken or written English. This formed the well-known Beta examination of the army.

The present examination is of the same general nature as the Beta examination, but differs from it in the following points:

Ten alternative forms of the examinations are provided in place of the single form, to reduce the harm from unfair tutoring.

Each form is more extensive.

In the score, speed counts relatively much less, the candidate being given time enough to exhaust his ability in most of the eight tests used.

In the Beta examination the examiner was permitted to use speech, and to vary his treatment of groups somewhat. In the present examination all procedure is rigidly uniform.

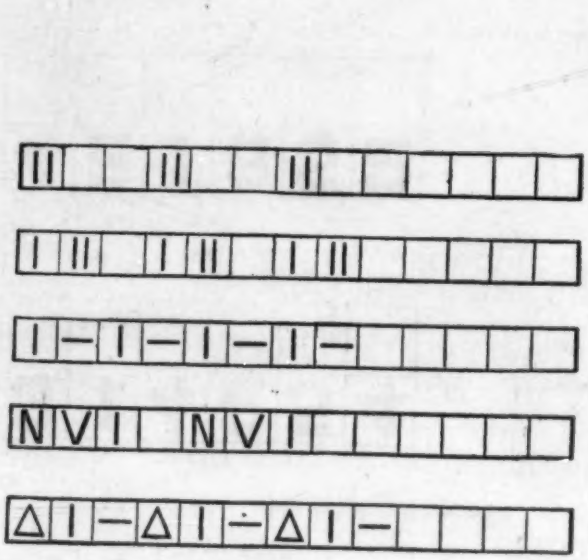
In the Beta examination the effort was made to secure in the directions the maximum of comprehension of the general nature of each task, the score being intended to represent the candidate's ability to do harder and harder elements of an understood task and to do them quickly. In the present examination the effort is to make the directions identical for all and such as will be unvaried in their effect by the examiner's personality, zeal, dramatic ability, or experience in giving the examinations. Each of these plans has its peculiar advantages.

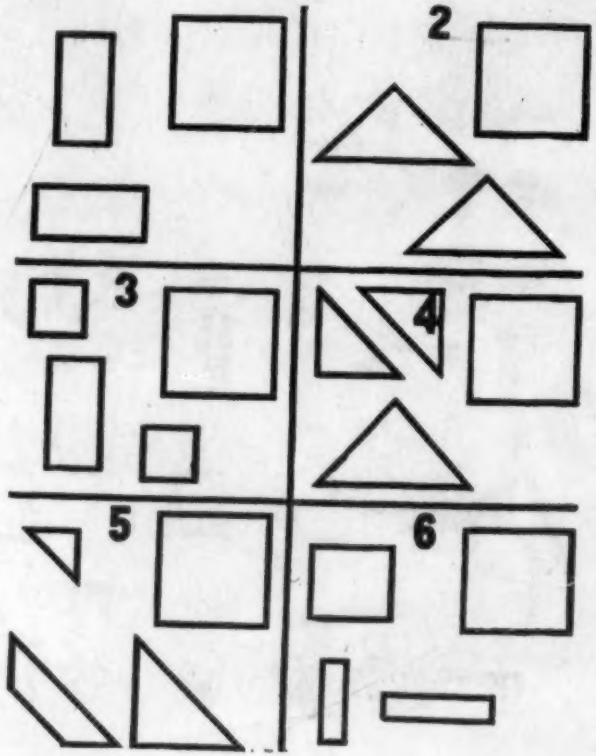
The content in the Beta examination was chosen primarily for high correlation with intellect as tested by the ordinary verbal forms of examination, such as the Stanford Binet or the Army Alpha examination. The Beta examination was intended for use as an alternative to Alpha. The content in the present examination was chosen primarily for high correlation with intellect as employed in managing both things and words. The examination is intended for use as a supplement to standard tests of verbal intelligence.

The following four types of tests used in the Beta examination are used also in the present examination: a test in substituting arbitrary symbols for digits; a test in drawing lines so

SERIES I. FRONT OF TEST-SHEET

SERIES I. BACK OF TEST-SHEET





SAMPLE SHEET FOR SERIES I. FRONT

1	2	3	4	5
X	V	V	=	I

3	1	4	2	5	4	

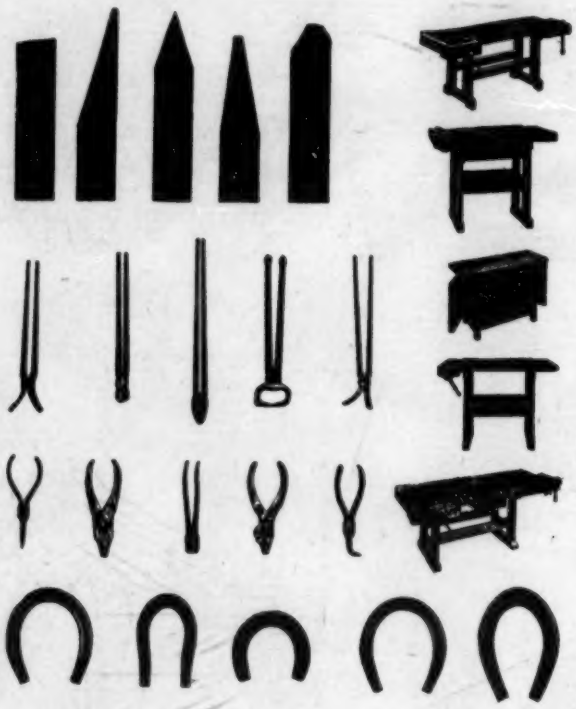
4	2	1	3	5	2	

SAMPLE SHEET FOR SERIES I. BACK

SERIES II. FRONT OF TEST-SHEET

SERIES II. BACK OF TEST-SHEET

SAMPLE SHEET FOR SERIES II. FRONT.



	3	7	26
+	2	4	95
	4		47
	48	88	541
—	17	70	263

SAMPLE SHEET FOR SERIES II. BACK

as to divide a surface into the parts shown beside it (the tasks are made rather harder, however); a test in completing pictures (the content here is however very different from that in the Healey, Pintner-Patterson, or Beta test, being made up largely of common material objects minus some essential part; a test in completing a rhythmic series of forms (the rhythms here are more varied, depend less on counting and are harder).

To these are added an analogies test with pictures,[1] a mixed spatial-relations test, a test of memory of objects, and a test in easy computation.

The material for an examination consists of two forms of Series I as shown on page 15-16, one form of series II shown on page 19-20, and the large sample sheets for I and II to be done by the examiner, shown on pages 17-18, 21-22.

The examination is given in three parts, I; I repeat, and II, the procedure being as follows: The candidates stand in a group of from 25 to 35 facing an easel on which is a large sheet, 36′ x 20′, like the *Sample Sheet for Series I, Tests 1 and 2*, shown below. The examiner says:

"We shall give you a sheet like this (holding up a Series I sheet). When you get it and are told to begin, do the work on it as fast as you can, but make no mistakes. If you come to something that you can't do, go ahead to the next thing. Do everything that you can. If you finish before time is called go back and make sure everything you did is right. Look at me. (If the group is large so that the two examiners are present, the instructions will be, 'Look at me or at the other man'). See what I do on this big sheet. When you get the sheet of paper, do the same as I did."[2]

He then fills the empty spaces in the five rows according to the pattern and draws lines cutting the squares into the parts shown, at a rate and in a manner prescribed for uniform use.[3]

He then turns the sheet over, displaying as its reverse the *Sample Sheet for Part I, Tests 3 and 4*. He writes X, V, etc.,

[1] This differs radically from that tried out and discarded by the Division of Psychology in the army. The test here is made very difficult, the four pictures from which choice is to be made all being relevant to one or more of the three which determine the choice, and the three "wrong" ones especially so. A right choice is not made by stupid people once out of four times nor even once out of ten times.

[2] These instructions may be spoken or displayed in printed form in any language desired.

[3] Detailed instructions for giving the tests are provided. The description here is abbreviated. Means to dispense entirely with language can be arranged if desired.

in the appropriate places, pointing to the blank spaces and to the key above after a prescribed method. In the last test of the four he marks the hat, cup, side-wheel steamer, and nest after certain instructive pointings.

The Part I test blanks are then distributed and 16 minutes are allowed for the work. At the end of 4 minutes the examiner says, "Even if you haven't finished Test 1, begin Test 2." At the end of 4 minutes more he says, "Even if you haven't finished Test 2, begin Test 3." Similarly at the end of 4 minutes more. Assistants see that these instructions are carried out by the candidates.

A different form of the same Series I is then used and with $2\frac{1}{2} + 2\frac{1}{2} + 2\frac{1}{2} + 2\frac{1}{2}$ minutes time, 10 minutes in all.

The candidates are then brought to the front of the room, the examiner directs their attention to a Part II sheet, and to the large Sample Sheet for Series II. Specimens of these appear on pages 19, 20 and 21, 22. The examiner fills in the missing parts, and draws the geometrical forms of Tests 1 and 2 of the sample sheet, making certain instructive pointings while doing so. He then does the work of Test 3, turning the large sample sheet over just as a candidate will have to do with the regular sheet, and finally does the computing of Test 4 on the large sample sheet.

The test sheets are then distributed and the men set at work. At the end of 4 minutes they are directd to begin on Test 2 if they have not already done so; at the end of 8 minutes they are directed to begin on Test 3 if they have not already done so. Similarly for Test 4 at the end of 12 minutes. At the end of 16 minutes all stop. The details for the administration of the examination will be reported elsewhere. One man can examine at one time as many individuals as can clearly see the large sample sheet, that is, from 30 to 40. An hour is required, of which 42 minutes are actual working time for the candidates. Any intelligent and careful person of the class of teachers, medical men, employment managers, social workers or the like can learn to give the examination adequately in an afternoon.

The results are quickly scored with the aid of keys. Tests I 1, I 3 and I 4, and II 3 and II 4 can be scored by any clerk. Tests I 2, II 1, and II 2 require either a moderate amount of judgment or a few hours of supervision by somebody of good judgment.

We have in this hour's examination obviously an extremely convenient instrument for measuring, and presenting in a numerical score, an individual's degree of success in meeting

certain demands on intelligence irrespective of language. If that score is significant of important facts about the individual, the examination is destined to be of value in schools, industry, business, social, philanthropic and legal work.

II. The Significance of the Examination Score

We shall consider first the significance of the score when the candidate takes it without having any previous acquaintance with it. In a later section we shall note any modifications or limitations to the significance of the score, supposing that the examination is public property (like the Stanford Binet) so that any person may study up for it as he may for a college entrance, or civil service, or immigration examination.

The examination, used under working conditions (i. e., in accordance with the detailed instructions prepared, by persons who had spent an afternoon in studying them and it, and a half-day in practice in testing school classes) yielded the following median scores for groups of increasing intelligence:

5 for 133 individuals 19 years old or over confined in institutions for idiots, imbeciles and the feeble-minded, and representing roughly the top tenth of their inmates in respect to intelligence. Less than 1 in 10 scores above 40.

95 for 171 sixth-grade boys largely of parents from the middle economic and social third of a large city.

115 for 190 sixth-grade boys largely of parents from the upper economic and social third of a large city.

170 for 169 fourth-year public high-school boys selected for continuance in school largely by ability. Only one in ten scores below 140.

210 for 104 superior adults, men commissioned or about to be commissioned in the United States Army. Only one in twenty-five scores below 140.

The distribution of all the individual scores for these groups, combining all the sixth-grade cases, is as shown in Table 1. It should be noted that the three individuals of the asylum cases who scored above 80 are described as follows by the authorities of the institution:

42 years old, understands most of the farm work, cares for horses and cows, drives team and plows, handles tools well. For quite a number of years has worked with engineers and steam fitters. Has done firing in boiler room under supervision. Enjoys and has a fair working knowledge of steamfitting and ordinary electrical repairs.

TABLE I.

FREQUENCIES OF EACH SCORE IN THE EXAMINATION IN THE CASE OF UPPER-LEVEL FEEBLE MINDED IN INSTITUTIONS, 6TH GRADE BOYS, 4TH-YEAR HIGH SCHOOL STUDENTS AND SUPERIOR ADULTS. IN PERCENTS.

	0	1–9	10–19	20–29	30–	40–	50–	60–	70–	80–	90–	100–	110	120	130	140	150	160	170	180	190	200	210	220	230–239	240–249	250–259
F. M's. in Institutions.....	34	37	13	8	7	1½	1½	2	1½		¼	¼															
6th Grade.....			¼	1	2	3	3½	7	7½	10	11	10	9	11	7½	10	4	2	1½	¼							
4th Yr. H. S...								½			½	2	½	1	5	11	5	5	12	16	8	6½	3	2	2		
Superior Adults													1	1	2		3	5½	4	13½	7½	11½	13½	13½	12½	8½	3

19 years old, reads and writes, does a little number work, has very good memory. Does wood-work well. Makes brooms, brushes with little supervision. Is quite deaf. Has worked for several years with the carpenter, doing repair work in the manual training department. Usually his work is well done. Is capable of doing high-class work both in this and about the farm.

19 years old. No personal report was made, but he is recorded as testing 9.9 mental age by the Binet test, and can read and write.

In the case of the feeble-minded confined at one of the two institutions, data were available for the Binet mental age, the grade reached in school and the ability shown in doing work in the institution and its farm colony. Scores were given to each of the 79 individuals in the form of the sum of credits obtained by counting:

B

0 for Binet age 6 or below
2 " " " 7
4 " " " 8
7 " " " 9
10 " " " 10
14 " " " 11
20 " " " 12

Sc.

0 for grade 2 or below reached
3 " " 3
5 " " 4
8 " " 5
12 " " 6

Wo.

1 for 6 or 7 attained as the sum of 5 estimates of the work report
2 for 8 or 9 " " " "
3 for 10 or 11 " " " "
and so on, up to
10 for 24 or 25 " " " "

Te

0.2 X the test score.

We have correlations (by Sheppard's formula) as follows, showing that the test score is as good an index of intelligence in these cases as the Binet:

Binet with	B + Sc + Wo + Te	.79
Test "	B + Sc + Wo + Te	.93
Binet "	Sc + W	.77
Test "	Sc + W	.77
Binet "	B + Sc + Wo	.91
Test "	B + Sc + Wo	.84
Binet "	Sc + Wo + Te	.75
Test "	Sc + Wo + Te	.97

The authorities of the institution also reported that the rank-order of intellect obtained by the test tallied very closely with the estimates which they had formed.

A more exact result than the above could be obtained by assigning weights precisely so as to give the Binet and the Test Score absolutely equal weight in determining the composites. In the above Test Score has somewhat more weight, the distributions being:

Credits	Binet	Test Score	Credits	Binet	Test Score
0	14	23	11		
1		10	12		1
2	24	12	13		4
3		1	14		1
4	25	6	15		1
5		3	16		
6		7	17		
7	11	2	18		
8		1	19		2
9		1	20	1	1
10	4	2	21		1
					and 1 at 30

However, Sheppard's formula being used, the discrepancy will not amount to much; and it does not seem worth while to expend labor in the computation. The test-score is at least substantially as significant as the Binet Score.

In the case of 196 privates and non-commissioned officers who were ranked by a consensus of their officers and fellow soldiers for intelligence, the correlations were .23, .33, .43, .50, .53, and .58 for the six groups, with a median of .47 $\pm$.05. This correlation is almost the same as that obtained between the consensus measure of intelligence and the regular army test Alpha in the case of sixty of these men who were tested with Alpha. The correlation with the real intelligence possessed by these men would presumably be higher, the amount of intellect imputed by the consensus being itself in each case an imperfect measure of the reality.

The test-score thus compares favorably with the score from the standard instruments for measuring intelligence, the Binet and the Alpha, in respect to the prophecy of intelligence given by it in the case of adults of low grade and adults in general. It is not suitable for distinguishing amongst adults of very high grade. Nor, in my opinion, is the Binet or the Alpha.

It has an advantage over the Binet, aside from its applicability to groups and to non-English speaking individuals. It is almost indefinitely extensible to alternate forms of equal difficulty so that a measure of any desired degree of reliability may be obtained, and measures of the effect of growth, training, fatigue, drugs or any other factor may be conveniently obtained. Ten forms are already prepared.

It has an advantage over Alpha aside from its non-verbal content, in that it distributes the cases of low intellect much more widely.

We have not been able to check the results against those from the Beta test, as yet. Presumably the two will do much the same work, the choice being primarily for convenience; though the lessening of the weight attached to speed seems to the writer theoretically and practically sound.

The test then seems destined to be useful alone, or with other "performance" tests, in the case of immigrants, illiterates, and all groups characterized by the absence of opportunity to learn English (or any other language) or great inequalities in such opportunity. It will be useful as an alternative for, or supplement to, the Binet, Alpha and similar tests in the case of those who can understand and use English.

The test scores may be transmuted into Alpha scores, or Stanford Binet Mental Ages, or standard points on the scale for sixth grade pupils, by Table II,[4] which is derived from the scores of 163 individuals tested with both this test and Alpha, 134 individuals tested with both this test and the Binet, and over a thousand individuals tested with this test alone.

These equivalents and other items entered in this table will give an adequate notion of the significance of any given score for any given person in respect to educational or vocational or general social promise, so far as these depend on the qualities measured by the test.

The scores of this table and all the results so far stated are for a first trial with the test by a person who has never been coached with a view to improving his score in this or a similar test. This introduces us to one of the chief difficulties of this and all other present instruments for the measurement of intelligence.

Improvement is made in score quite innocently in a second trial though the individual has never thought of the test in the meantime, by reason of the general familiarity with the tasks, adaptation to them, and whatever other special advantages a preliminary trial gives. In the Binet this averages about 3 mo. of mental age; in the Alpha the median gain is about 15 points (unweighted system) for men of A and B grade; in the present test the median gain is 10 points for sixth-grade school boys and average adult men, and 14 points for superior adults. This matter can be neglected so long as the tests are little known and used only for diagnosis and surveys. As they become widely known and are used to

[4] Table II is an abstract from a more extensive and detailed table.

TABLE II.

Test Score	Equivalent Alpha Score	Equivalent Stanford Mental Age in F. M.'s.	6th grade Boys	Stanford Mental Age Estimated
2		7½		
5	Median of 133 high grade.		F. M's. in institutions	
10		8		
25		8½		
37			—2.0 S.D.	
40	40			
45	42			9 yr. 6 mo.
50	44			
54			—1.5 S.D.	
55	47			
60	49			
65	51			10 yr. 6 mo.
70	53			
71			—1.0 S.D.	
75	55			
80	57			
85	59			11 yr. 6 mo.
87			—0.5 S.D.	
90	61			
95	63			
100	Median 12 yr. 0 mo. old boy			
105	67		0	
110	69			
115	70			
120	72		+0.5 S.D.	
122				
125	74			
130	76			
135	78			
139			+1.0 S.D.	
140	82			
145	86			
150	90			
155	93			
156			+1.5 S.D.	
160	97			
165	101			
170	Median 4th year H. S. boys			
172	106		+2.0 S.D.	
175	109			
180	114			
185	117			
190	120			
195	123			
200	126			
205	129	Superior Adult		
210	132			
215	135			
220	138			
225	141			
230	145			

measure progress or the effect of various factors, it must be allowed for, and tables for the significance of second-trial scores, third-trial scores and so on must be computed. The gain of a third trial over a second may be expected to be much less than that of a second over a first, roughly about .4 as much.

Improvement may be made in score by tuition over what would have been made without it. This is obvious to common sense. The tuition may be multiform, from general

coaching in taking tests to special drill in drawing a diamond or counting backward or defining words or learning opposites or understanding what is required in the analogies test or solving particular arithmetical problems. Experiment can determine the amount of influence of any defined amount of such coaching, and various measures can be taken to prevent illegitimate coaching from injuring the significance of a test score. Some of these are the provision of many alternative forms, the changing of test elements so that special coaching will mislead as much as it helps, the provision of a preliminary trial to put those who have not been coached more nearly on a level with those who have, so far as understanding the general nature of the test goes, and the separate computation of scores from the more coachable and the less coachable tests of the series.

In proportion as a high score in this test is used to confer any advantage upon an individual the procedure will have to be made adequate to prevent or at least detect such special coaching. This is even more true, however, of other standard examinations for intelligence, since they lack the protection of many alternative forms. Much such work must be done in the future.[5]

It should be noted that for many purposes the energy and ambition and industry of a candidate who studies ten or a dozen alternative forms of a test like this, so as to score high with whichever one confronts him at the examination, is a practical equivalent of the ability which enables him to score equally high without study. Such might be the case in many examinations for employment.

For cases where the test is to be used to measure progress or the effect of some factor, the reliability of the score is a matter of importance. The question as to how closely the score from one first trial of the test will represent the average score from an infinite number of first trials is of course essentially unanswerable. There is, however, a means of obtaining an approximate answer by the formula P. E. $= \sqrt{2}$ (median variation of difference between first-trial score and second-trial score).

According to this the probable error of a single determination of the test is:

[5] These matters have been more fully discussed by the writer in Tests of Intelligence: Reliability, Significance, Susceptibility to Special Training and Adaption to the General Nature of the Task, in *School and Society*, of Feb. 15, 1919.

14 for superior adults with a median score of 210
8 for adults somewhat above average with a median score of 140
8 for 6th grade pupils with a median score of 95

These results are based on repeated tests of 54, 46 and 143 individuals respectively. These figures are too high since they are a product of other causes of variability than the differences in the same ability in the same individual from one day to another. It is therefore conservative to estimate the Probable Error of a first time score as not over 6 or 7% of the score, for scores from 70 up.

The unreliability of a single second trial as a representative of the theoretical average of an infinite number of second trials, and similarly for a third or for a fourth trial, will presumably be less than the estimates given above for a first trial. Certain causes of variability are removed by acquaintance with the general nature of the test. We may, I think, expect that if two trials are given as practice tests and then a third and fourth trial as tests of morning versus afternoon, or of ability at age 15 versus ability at age 16, or of alcohol versus no alcohol, or the like, the probable error of the second score will be well under 6% of the score itself.[6]

[6] These tests may be obtained from the Bureau of Publications, Teachers College, Columbia University, together with the large sample display sheets and the standard instructions for giving and scoring the tests.

EDUCATIONAL DIFFERENCES AMONG TRADESMEN

HERBERT A. TOOPS and RUDOLPH PINTNER, Ohio State University.

In no other country and at no other time has there ever been such emphasis laid upon the necessity for a sound education in order to make good in the business of life. We believe in education. We know that good schooling is an asset to any man in any walk of life. The war has brought the fact home to us as never before. And the people of this country believe in it so much that they are willing to see their government spend thousands of dollars in order to allow some of the youth of the country to continue their college training at the country's expense.

That there is a relationship between the amount of education and the kind of position a man occupies is obviously true, despite individual exceptions. Between the trade and the profession there is a very marked difference. Does the same difference occur among the trades themselves? If so, what do we actually find to be the educational achievement of men in the various trades and how do the trades rank among themselves in regard to the educational attainments of the men?

The writers have had the opportunity of personally ascertaining the amount of education obtained by a great many tradesmen in a number of trades. The results and the conclusions derived are here presented, not as an exhaustive survey of even a single trade, but as indicative of some general existing tendencies.

The tradesmen questioned were employed in various shops of a large manufacturing city. They came from both large and small shops. In some cases practically every man of the trade in the city was questioned; in other cases only a liberal sampling was taken. The men in all the trades here considered are probably representative of the general type of man in each trade as found in this city.

In addition to the grade at which each man left school, there was determined as well the status of the man in his trade, whether apprentice, (A), journeyman, (J), or expert, (E). In rather a general way the definition of each status or class was as follows:

Apprentice—A beginner or learner in the trade, determined by length of experience in the trade, kind of shop, and the foreman's estimate of the man. In no trade was more than five years experience necessary as an apprenticeship stage for ordinary individuals.

Journeyman—A man past the apprenticeship period but not yet an expert. A practical criterion for a journeyman was that he was incapable of working without directions or incapable of directing others. A man with the requisite minimum of experience for an expert but not so classed by his foreman, was classed as a journeyman.

Expert—A man past a definite minimum of experience and classed as an expert by his foreman. A foreman of a shop was nearly always classed as an expert. A man capable of acting as a foreman or capable of working alone on difficult jobs without direction from others was also ordinarily classed as an expert.

It can be readily seen that there is no sharp dividing line between these classes, which are only arbitrary and artificial classifications. These three classes are, however, commonly recognized in the trades. In many cases it was difficult to decide in which status to put a given man. In such cases all possible evidence was taken into account and the man classified according to our best judgment based on this evidence. Since the dividing lines between the classes are only arbitrary divisions we find not only much overlapping of trade ability, but also much overlapping in any trait in which the classes might be measured, and therefore, in their educational attainments.

Many of the trades are similar in scope, as for instance, lathehand and toolmaker. Here we should expect great similarity in the education of the men in these trades. Other trades may be found which are very dissimilar, as horseshoeing and electrical instrument repairing. Between such trades we expect striking educational differences to occur.

Reports from 924 tradesmen are here given. These are distributed among thirty different trades. The blacksmiths were machine shop blacksmiths doing hand forging. The telephone linemen included a small number of telegraph linemen doing the same kind of work. The carpenters were house carpenters. Bench-hand is the name given to the trade of bench assembler and fitter. Powerhouse (A. C. and D. C.) were switchboard tenders on these respective kinds of switchboards. Electrical instrument repairers were ammeter and voltmeter repairers. General auto repair is but another name for general garage man. The ammonia pipefitters were re-

frigerating pipefitters. Storage battery men had to do with repairing automobile storage batteries. The switchboard repairers were telephone switchboard repairers at telephone stations. The carburetor men were general garage men who

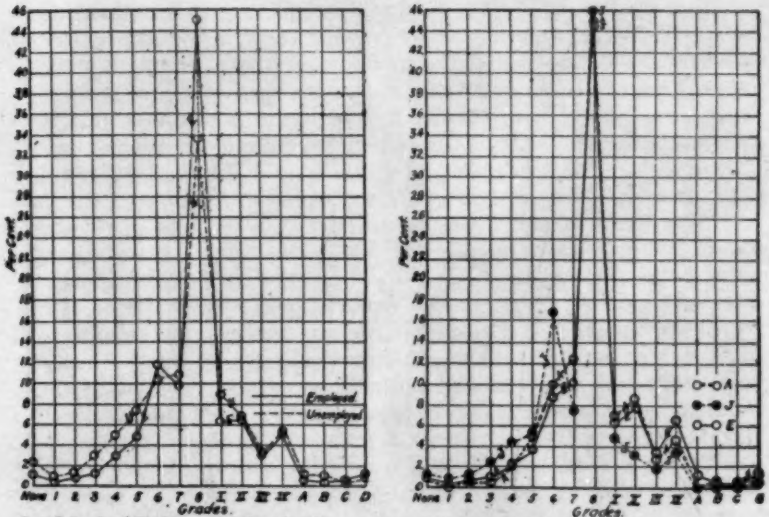
TABLE I. DISTRIBUTION OF TRADESMEN, IN NUMBERS AND PER CENT, BY GRADE AT LEAVING SCHOOL AND BY TRADE STATUS

Grade	Numbers				Per Cent.				
	Employed				9,506	Employed			
	Total	A	J	E	Unem.	Total	A	J	E
Column	1	2	3	4	5	6	7	8	9
None	9	2	4	3	2.1	1.0	0.8	1.3	0.8
1	3	0	2	1	0.8	0.3	0.0	0.6	0.3
2	7	1	4	2	1.3	0.8	0.4	1.3	0.6
3	11	1	7	3	2.7	1.2	0.4	2.3	0.8
4	26	5	13	8	4.8	2.8	2.0	4.2	2.2
5	43	13	16	14	7.3	4.7	5.1	5.2	3.9
6	109	25	52	32	10.2	11.8	9.9	16.9	8.8
7	91	31	23	37	10.6	9.8	12.3	7.5	10.2
8	417	113	142	162	33.8	45.1	44.9	45.9	44.6
I H. S.	56	18	15	23	8.8	6.1	7.1	4.9	6.3
II H. S.	59	21	10	28	6.6	6.4	8.3	3.2	7.7
III H. S.	25	7	6	12	3.0	2.7	2.8	2.0	3.3
IV H. S.	46	11	11	24	5.2	5.0	4.4	3.5	6.6
A College	5	..	..	5	0.8	0.5	...	...	1.4
B College	3	2	..	1	0.8	0.3	0.8	...	0.3
C College	4	..	2	2	0.3	0.4	...	0.6	0.5
D College	10	2	2	6	0.8	1.1	0.8	0.6	1.7
Total	924	252	309	363	99.9	100.0	100.0	100.0	100.0
Part H. S. or better education					26.4	22.5	24.2	14.9	27.8
Part College or better education					2.8	2.4	1.6	1.3	3.9
Median Grade at leaving school					8.30	8.39	8.43	8.24	8.51
Median Grade of Jour. + Experts					..	..	..	8.38	

were specialists on the carburetor work of gasoline motors for automobiles.

The number and percentage distributions of the tradesmen by grade at leaving school and by trade status, are shown in Table I. For comparison with the results for all 924 men (column 6) are also shown the percentage results from 9,506

unemployed men (column (5) previously reported.[1] The median grade of the employed men is found to be only 0.09 grade higher than the unemployed median. This might seem to point to no very great difference between the two groups. We have also previously pointed out the great stability of the medians of such large educational groups, and the significance of small changes in the median as well as the necessity of basing our judgment upon the actual distribution rather than the central tendency.[2] By plotting the percentages of columns 5 and 6, we obtain the curves of Graph I. We note the great



Graph I. Employed Tradesmen and Unemployed Men. Graph II. Divisions, by Status, of Tradesmen.

Elimination from School, by Grades.

inferiority of the unemployed group up to about the middle of the fifth grade shown by the large percentages of unemployed in the lower grades as compared with the percentage of employed in these same grades. The ratio of the two series of percentages is the real comparative measure of the two groups. Almost twice as many unemployed men leave school at each grade up to grade five as of employed men. In

[1] Toops, H. A. and Pintner, R.—Mentality in Its Relation to Elemination from School. *School and Society*, Vol. VII, Nos. 174-175, pp. 507-510, 534-539, April-May, 1918.

[2] Toops, H. A. and Pintner, R.—Variability of the Education of Uneemployed Men. *Journal of Applied Psychology*, Vol. II, No. 3, Sept. 1918, pp. 207-218.

consequence of this, there is a much larger percentage of employed men than unemployed leaving at the eighth grade. In terms of ratios of percentages, the differences of the two groups at the eighth grade is much less significant than the difference between the two groups at the third grade. In the higher grades the differences are not so striking. Curiously enough, the "psychology of completion"[3] is much more marked at the seventh grade in the case of the employed men than the unemployed men, as we might expect.

By plotting the percentage distributions of the trade classes, we find rather marked educational differences as shown in Graph II. The amount of school elimination for apprentices is very similar to that of experts, and there is much overlapping of these two curves. In the case of the journeymen, we find a marked differentiation between this class and the other two classes. The journeymen have distinctly more elimination in the lower grades and much less in the higher grades, thus proving them to be, as a class, quite inferior to experts in the amount of education attained. This fact is also indicated by their median, 8.24, which is the lowest of all three medians as shown on Table II. The median of the apprentices is lower than that of the expert, as we should expect, if education has anything to do with trade success. The apprentices, by reason of being beginners in the trade, must contain both potential experts and also those who, even with the requisite amount of years of experience in the trade will not become experts. The effect of the "psychology of completion" is quite marked in the case of the journeymen only. Instead of this, we notice in the elimination curve an entirely new phenomenon, namely, a sudden rise in elimination in both apprentices and experts at the II grade of High School. Such irregularities in the curve may of course possibly be due to the comparative smallness of the numbers involved; the possible significance of these, should they prove to be real phenomena peculiar to these classes, will be discussed later. Experts and apprentices differ mainly from the journeymen in the relatively low proportion of poorly educated men and the relatively high proportion of better educated men with respect to the corresponding journeyman percentages.

The median grades by trades and the number of cases on which these are based are shown in Table II. The variation of the medians is not great, the range being only about three grades. In the division by trade status, in only one class, Journeymen, is the average deviation of the individual trade

[3] Cf. *Op. cit.* in Footnote 1.

TABLE II. DISTRIBUTION OF CASES BY TRADES; AND MEDIAN GRADES BY TRADE CLASSES AND BY TRADES

Trade	Rank Value	Number of Cases Total	A	J	E	Median Grade* A	J	E	Total
Horseshoer	1	9	2	6	1	...	....	...	7.0
Cobbler	2	21	5	5	11	...	....	7.5	7.3
Blacksmith (Shop)	3	18	..	9	9	....	6.7	8.3	7.5
Bricklayer	4	53	12	20	21	8.3	7.9	8.0	8.0
Lineman (Teleph)	5.5	54	14	12	28	8.4	8.3	8.1	8.2
Carpenter	5.5	42	14	19	9	8.6	6.5	8.4	8.2
Locomotive Repair	9.5	33	..	17	16	....	6.8	8.7	8.3
Harness Maker	9.5	10	..	2	8	....	....	8.3	8.3
Bench Hand	9.5	43	15	15	13	8.4	8.3	8.5	8.3
Steamfitter	9.5	27	16	1	10	8.2	....	8.4	8.3
Auto Truck Mech.	9.5	45	12	18	15	8.1	8.2	8.8	8.3
Typewriter Repair	9.5	30	4	10	16	....	8.4	8.4	8.3
Sturc. Steel Erec.	14.5	20	1	6	13	....	....	8.4	8.4
Sheetmetal Work	14.5	16	3	6	7	....	....	8.6	8.4
Powerhouse (A.C.)	14.5	47	13	16	18	8.2	8.3	8.8	8.4
Powerhouse (D.C.)	14.5	38	12	16	10	8.4	8.1	8.9	8.4
Toolmaker	17	50	24	14	12	8.6	8.2	8.8	8.5
Plumber	20.5	47	12	15	20	8.8	8.5	8.6	8.6
Vulcanizer	20.5	18	4	2	12	....	....	8.6	8.6
Motor Repairer	20.5	38	13	14	11	I.0	8.4	8.5	8.6
Elec. Inst. Rep'r.	20.5	20	13	3	4	8.3	....	....	8.6
Inside Wireman	20.5	43	11	19	13	8.5	8.4	II.0	8.6
Gen. Auto Repair	20.5	40	14	11	15	8.5	8.5	8.9	8.6
Patternmaker	24.5	40	18	14	8	8.8	8.8	8.9	8.7
Ammonia Pipef'r.	24.5	17	3	10	4	....	8.9	....	8.7
Lathe Hand	26.5	25	8	8	9	II.2	8.6	II.0	8.8
Motorcycle Rep'r	26.5	17	..	7	10	....	8.8	8.9	8.8
Storage Batym'n.	28	19	..	4	15	....	....	I.5	I.5
Switchboard Repairer	29	31	9	8	14	III.0	I.3	8.9	I.6
Carburetor Man.	30	9	..	..	9	....	....	II.0	II.0
Total[b]—All Trades		920	252	307	361	8.43	8.24	8.51	8.39
		Average Deviation				0.43	0.53	0.43	0.38

* Median not calculated for less than 7 cases.
[b] One trade with only 4 cases not included in this table.

medians from the median of all the men in the status, irrespective of trade, more than one-half a grade. We note also that the deviation of the total 924 men by trades from the median of the whole is less than any of the classes. This is one more indication of the remarkable stability of the central

tendency of education when large groups of men from many trades are considered; or in other words, the more nearly we approach an unselected sampling of the total population.

One may quite reasonably ask whether these results are based on a sufficiently large enough number of cases, and whether there actually exist such basic differences in the schooling of different tradesmen, as to consider the median grade a reliable index. After the results of the thirty-one trades had been tabulated, similar results were secured for six trades in a city in a different part of the country. Two of these trades, cook and brass melter, were not included in the 30 trades studied, and data were also secured for these at the first city, designated as City A. The resulting medians, given in Table III, suggest that even in widely different parts of the country, the medians by trades are not apt to vary on the average more than 0.3 of a grade. Those trades were selected

TABLE III. RELIABILITY OF TRADE MEDIAN GRADES

Trade	City A		City B	
	Cases	Median	Cases	Median
Horseshoer	9	7.0	12	7.4
Carburetor	9	11.0	21	11.3
Blacksmith	18	7.5	13	7.3
Motor Repairer	38	8.6	17	8.5
Cook*	20	8.1	37	8.0
Brass Melter*	21	7.5	30	6.9

* Data received too late to be included in Tables I, II, and IV.

which showed graduated differences in median from lowest to highest in order to test out whether the same significant range would be found at City B.

If we examine carefully the medians of Table II in the light of our knowledge of the trades, we may draw several conclusions therefrom.

In verification of the general results that journeymen are more poorly educated than either apprentices or experts as shown by the medians of the classes, we find that in 9 or three-fifths of the trades for which the A, J and E medians are calculated, journeyman medians are the lowest of the three. In 17 or 85 per cent. of the trades in which both J. and E medians are calculated, the journeymen tradesmen are less well educated than the experts.

In those trades in which the expert has a radically different line of work from the apprentice, the experts are much better educated. Examples are the auto truck mechanics in which the expert usually is a foreman of a general auto repair business including touring cars, and the two powerhouse trades in which the expert is usually a dynamo tender as well as a switchboard tender.

In trades involving great personal discomfort we are likely to find the general education low. Examples are the trades of brass melter, cook, blacksmith and horseshoer. In each of these trades we find a poor general education, and in each the personal discomfort due to heat is well marked. We believe that men are attracted toward the cleaner, more comfortable and better paid trades, and that the better educated are somehow able to secure the majority of these jobs thus forcing the less well educated to take the more undesirable jobs. In such trades, when work is plentiful, we find only the poorest type of apprentices entering the trade. Not one of the apprentice cooks or brass melters in City A, and only three cooks in City B, came up to the median of the trade as a whole. In the blacksmith and horseshoeing trades, two trades with low educational attainments as well as low wages, there have been practically no apprentices learning the trade during the past several years.

Relation of the Grade At Leaving School to the Average Kind of Trade Characteristic of the Grade

From the medians of Table II, we are able to see that there is some relation between the grade at which a boy leaves school and the trade which he enters. We wish now to secure some measure of that relation.

In order to do this, the trades were arranged in order of their total median grades, and rank values were given to each trade as shown in the second column of Table II. Horseshoers, with the lowest total median is given the rank, 1; carburetor man, at the other end of the range, is given the rank of 30. Then, from the crude number distribution by grades and by trades was calculated the average trade rank of each grade.

The sampling is of course quite small in the very lowest and very highest grades, and could undoubtedly be improved by securing larger numbers at these grades. From the results of the above computation, the average trade entered by third grade men may be assumed to be about that below structural steel erecting, if we consider the number of cases large enough

GRADE III HAS 11 CASES AS FOLLOWS

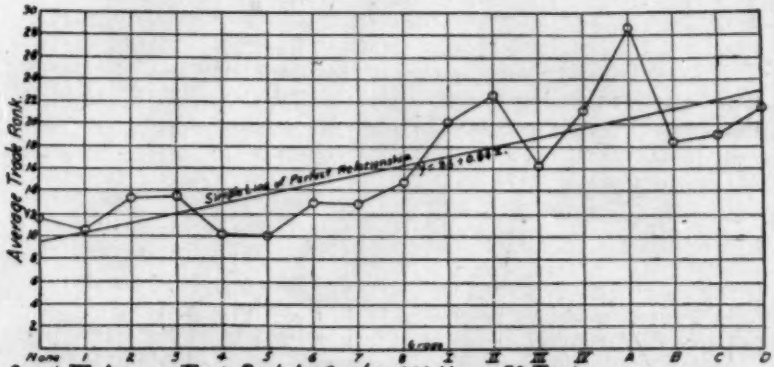
No. of Cases	Trade	Trade Rank	Product Cases x Rank
1	Cobbler	2	2.0
2	Carpenter	5.5	11.0
2	Switchboard Rep.	29	58.0
2	Telephone Lineman	5.5	11.0
1	Locomotive Repair	9.5	9.5
1	Elec. Inst. Repair	20.5	20.5
1	Inside Wireman	20.5	20.5
1	Powerhouse A. C.	14.5	14.5
11			147.0
		Average	13.4

to justify such a conclusion. The average trade by grade, the average deviation in trade rank from these averages and the number of cases upon which they are based are all shown in Table IV. We note a general tendency of these average trade ranks to increase with increase in the amount of education as we should expect. If the relationship were a perfect

TABLE IV. CORRELATION OF THE AVERAGE TRADE PER GRADE WITH THE GRADES

Grade	To Correlate with rank	Average Trade	Average Vi= Deviation	Number of Cases
None	0	11.6	8.7	9
1	1	10.5	6.7	3
2	2	13.3	5.2	6
3	3	13.4	8.4	11
4	4	10.1	5.0	26
5	5	10.0	5.0	43
6	6	12.9	6.6	108
7	7	12.8	7.0	91
8	8	14.7	6.6	417
I H. S.	9	20.1	5.7	56
II H. S.	10	22.6	6.4	59
III H. S.	11	16.2	6.6	25
IV H. S.	12	21.1	6.1	45
A College	13	28.6	1.4	5
B College	14	18.5	3.3	3
C College	15	19.0	2.2	4
D College	16	21.3	6.2	10
Average		16.3	5.7	Total
(Pearson) r =	.79 ± .06		...	920

one we should have, as the simplest (example), a straight line curve when these averages are plotted against the grades themselves. When, however, we plot these (Graph III) we find much deviation from a straight line, due perhaps in some cases to the smallness of the numbers and also to the fact that we should actually expect more deviation at the extremes of the series if the grade at leaving school is the result of more than one factor as it is known to be. Not only should these averages be such that each succeeding one should be larger than the preceding but they should be in some series order, the simplest of which is of course an arithmetical series, or 0, 1, 2, 3 — 16 order. One measure of this is a correlation ratio. The Pearson correlation, *r*, between this arithmetical



Graph III Average Trade Rank, by Grades. 920 Men in 30 Trades.

series and the average trade values by grades is 0.79 with a probable error of 0.06.

By employing the method of *least squares,* we may give large amount of weight to the extreme deviations which seems desirable, and may determine a straight line equation which will best fit the defective data at hand.

The equation of the line of least square deviation is $y = 9.51 + 0.84\,x$. This line is plotted on Graph III.

Mentality and its Relation to the Trades and Trade Status.

We have previously pointed out the probable close relationship of mentality to education. In the present work we have often felt convinced that the only difference between many journeymen and experts was one of intelligence. This is often so considered by the foreman in charge of the men. A few

quotations of foremen are here given as examples of the layman's method of expressing the mental disabilities well known to the clinical psychologist by other terms:

> "He makes good journeyman wages and works all right as long as the machine works all right; but if anything goes wrong, he can't fix it."
>
> "He hasn't the head for an expert, although he is just as good a workman as this other man (an expert)."
>
> "This man works all right so long as I tell him what to do."
>
> "He isn't 'all there' when it comes to doing new jobs."
>
> "The man can work all right as long as he is told what to do but he can't reason out things for himself."
>
> "He can follow a drawing all right, but he can't figure out things."

If we examine certain of our medians we may get some interesting light on the practical nature of the differences between the different trade classes.

The median grade of journeymen plus experts is 8.38; that of journeymen plus experts plus apprentices is 8.39. This suggests that journeymen and experts are but later differentiations of the one class, apprentices or beginners, the better educated class falling in general into the expert group and the poorer educated class falling into the journeyman group. Furthermore the median of journeymen plus experts (8.38) is an exact average between journeymen and experts (8.24 to 8.51). This suggest that journeymen may also be further split up into two classes. For, if the average of the median of 309 J + median of 363 E = median of the distribution of 672 journeymen and experts combined as one distribution; then, since, only if there were a real basic difference in the education of journeymen and experts and equal numbers of each if the groups were normal groups, would this relationship hold true, a plausible explanation under the circumstances is that the journeymen are made up of an undue proportion of the poorer educated which may arbitrarily be considered as one class, and of a small proportion of better educated men which may be considered another class.

In the light of the foregoing opinions of foremen we would interpret this as indicating two classes of mentality to be distinguished among the journeymen; first, those of high mentality who are classed as journeymen merely because of having not yet had sufficient years experience to be classed as experts, and secondly those "doomed to be journeymen all their days."

If, then, we should exclude from the journeyman median those who are future experts *in embryo,* we should find a much lower median of education of the remaining class.

Greater average deviation by trades (Table II) from the median of the status would seem to indicate that the journeyman period is a period of adjustment of the workmen to jobs. The poorer educated and more poorly mentally endowed, after a few years of trial at work begun, we must think, on a more or less hit-and-miss principle of trade selection, are forced by the competition of better educated and better mentally endowed men to make new adjustments to their industrial life when time has given opportunity for their mental shortcomings to become apparent. At least one large industry of the country removes from the payroll any man who fails to progress beyond a given point in learning the trade and is not thus continually becoming more useful to the company. The mentally inferior are thus practically forced to accept the less desirable and less responsible positions.

The curves of Graph II, while not based upon a sufficient number of cases to be taken as positive evidence, seem possibly to indicate that the conflict between mentality and ability to progress well in school work comes later, on the average, in the case of apprentices and experts (about I or II H. S.) than in the case of journeymen. The peculiar rises in the elimination curves of the apprentices and experts at II H. S., a phenomenon not previously noticed and also absent in the case of the journeymen, while the ordinary 6 and 7 grade peculiarity is absent in both the expert and apprentice curves, would certainly indicate such a conclusion if the existence of these peculiarities in the curves should be confirmed by future investigation.

Unemployed men have several times been shown to have lower mentality than the population taken as a whole. Since these differ presumably from the whole population in education mainly in the greater proportion of poorly educated men we conclude that the unemployed group contains an undue proportion of the "doomed to be journeymen" class of men. Periodical calls at the employment office is thus but one of the incidents in the life of such unfortunate individuals that serve to indicate to the outside observer the readjustment of mentality to the demands of the trade. Of men who change their trade after a few years work we should expect the larger part to take up new trades of a similar character. Those who do so would be the class with the greatest amount of mental deficiency. We believe that the better endowed man is more apt

to remain in even a very simple trade when he discovers that he has entered a trade not requiring all of his mental ability, for the simple reason that on account of that superior ability he is able to make rapid progress in the trade and win promotion rapidly. This is a problem for future investigation.

Relation of the Education of Tradesmen to That of the Professions and of Laborers.

The best known professions are quite commonly recognized as requiring a college degree as a necessary prerequisite for entrance into the profession. The semi-professions would also undoubtedly rank high in educational attainments.

The education of laborers in its relation to that of tradesmen is not so clearly apparent from merely our knowledge of the arbitrary standards demanded, as for example, of anyone who would follow the professions. Laborers require surely the least of knowledge gained from school study. Do then the ranks of the laborer contain only men of a small amount of education, or do they contain as well many men of a fair or very large amount of education?

In an attempt to answer this question, we present here the tabulated results by grades of 50 each white and colored laborers chosen at random from the files of the Personnel office, Camp Dix, New Jersey.[4]

PERCENTAGE DISTRIBUTIONS BY GRADE AT LEAVING SCHOOL OF FIFTY EACH WHITE AND COLORED LABORERS AT CAMP DIX, NEW JERSEY

Color	Per Cent at Grade:— None	1	2	3	4	5	6	7	8	I	II	Total	Median Grade
White.....	56	14	6	14	6	2		2				100	0.91
Colored.....	44	16	8	10	2	6	6	4	2		2	100	1.44
Both.....	50	15	7	12	4	4	3	3	1		1	100	1.00

The results here presented may be too low for laborers in general, due to the fact that most of the white laborers were foreigners, and also to the fact of the great demand at this time for men of fair ability in the more skilled trades. These together account for the lower median grade of the white laborers. Native born white laborers may be expected to have a slightly better education perhaps than that here indicated for the colored men.

The data is quite conclusive evidence that the occupation of laborer, the one requiring least skill and ability, is held

[4] We gladly acknowledge our indebtedness to First Lieutenant E. S. Gregory, Jr. for his cooperation in securing this data.

generally by persons of very inferior education. Eighty-eight per cent of the laborers have less than a fifth grade education On the other hand, over eighty-nine per cent, or a larger percentage, of all the tradesmen are found with an education equal to or better than a fifth grade education.

Industrial Selection of Men and Trade Guidance by the Amount of Education Attained.

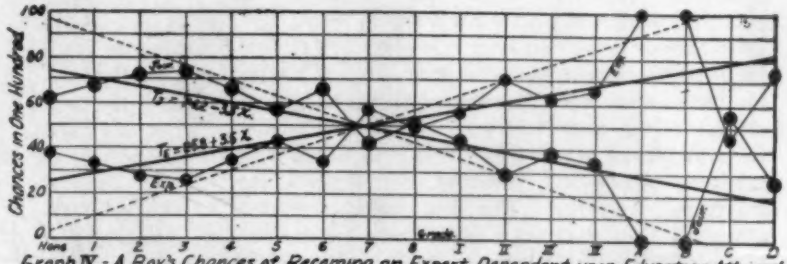
From the employer's point of view, of two men of equal skill and trade ability (irrespective of years of experience) the more valuable man would ordinarily be the more intelligent one. Given equal chance to learn the trade, this would ordinarily mean the man who could learn the trade more quickly. In some cases, however, there is a distinct demand for the moron type of individual. "He is better satisfied and will take more from his foreman." In such cases High School graduates would scarcely be in demand at all. A low degree of education would usually pick out such an individual; this however, is seldom needed as it is usually possible to pick out the extreme types of intelligence by simple methods much better than by the criterion of education.

In those trades demanding a high degree of skill and responsibility, high school men would seem to be desirable. Our figures show that in only 41 per cent of the trades considered are there more than one-fourth of the men in the trade who have even entered high school. Of the experts, in 55 per cent of the trades have one-fourth or more of the men entered high school. This clearly indicates where "expert timber" is grown in greatest abundance. Of the journeymen, only 27 per cent of the trades have one-fourth or more of their men who have entered high school.

Only 14.9 per cent of journeymen have some high school education, while 27.8 per cent, or nearly twice as many, experts have some high school education. The experts exceed the apprentices by only 3.6 per cent on this score, due no doubt to the fact that many of the better educated men reaching the expert class go even higher into the executive positions where they are no longer considered tradesmen in the ordinary sense of the term, a man toiling at a trade. These figures are such as to further confirm our belief that among the journeymen we find a smaller percentage of well educated men.

From the percentages of Table I, we can, by comparison of the journeyman and expert percentages, roughly predict what will be a boy's chances, on the average, of eventually becoming an expert or of remaining a journeyman if he leaves school

at a given grade. The percentages for the journeymen are probably too low in the lower grades for an exact determination of this as has already been pointed out. If we plot the percentages of Columns 8 and 9 of Table I as percentages of their sum, we secure the curves of Graph IV. The curve, Exp. represents the number of chances out of one hundred a boy has of becoming an expert if he leaves school at a particular grade. The curve, Jour., gives the same for his chances of becoming and remaining a journeyman. This data can also be subjected to the method of *least squares* whereupon we secure the straight line equations, T-E and T-J, (Graph IV) which are perhaps as representative of the facts, and are much simpler to comprehend. By reference to these curves, we may say that if a boy leaves school before the seventh grade, the chances



Graph IV.- A Boy's Chances of Becoming an Expert Dependent upon Education Attained

are greater that he will be a journeyman than that he will become an expert, the chances of permanently remaining a journeyman being greater the less education he has. After the seventh grade, where the chances are about even, the chances for eventually becoming an expert gradually increase until in about four out of every five cases will a college graduate become an expert. Were the percentages of Table I corrected so as to include in journeymen only those "doomed to be journeymen" we might expect the true position of the curves, T-J and T-E, to assume somewhat the positions of the dotted lines of Graph IV.

Trade Education of the Men Examined.

Few of these men had any original trade instruction. Such trade instruction as they received was largely at the hands of hard experience or of still more exacting and unappreciative foremen. The method of instruction is left almost wholly to the shops themselves. Such instruction must then necessarily be more or less of the same calibre as the men who work

at the trade and who instruct the incoming apprentice. The writers have become quite convinced that the time required to produce a journeyman workman—five years in many cases—is entirely too long with men of average intelligence. Not only could the average person learn the trade much quicker than this if given the opportunity, but in many cases he is prevented from so doing by a lock-step system of apprenticeship. The successful experiments now being undertaken by the War Department, wherein men of fair intelligence and general training are taught just such trades as these in short courses is well worth watching by our educational and industrial leaders.

We have the testimony of the educational director of one of the largest industrial concerns of the country to the effect that "a two year apprentice with organized school-shop instruction can not only produce as good work as a five or six year journeyman without the instruction but he is more valuable to the company because he knows "why he does things." Or as another very intelligent foreman expressed it, "the real expert is the man who can run a machine when the machine fails to work; anyone can run a machine when the machine is working properly. The expert knows the 'why' of the machine." Perhaps the first man overlooked the fact that many of the boys who come into his hands are the boys of better intelligence to begin with and would have done fairly well without the school-shop instruction, as this company is rather careful in choosing its employees. The second man may have under-estimated the value of the human element in the production with "things going well."

Inasmuch as most men differ greatly in their rates of learning the "why" rather than in their ability to eventually learn these comparatively simple trades, it seems quite evident that organized trade instruction in the shops or in the schools would do much to alter the proportion of the journeymen and experts with the favorable balance on the expert side.

Finally, if the results found for the education of laborers be taken to represent the education of laborers in general, and if those found for tradesmen be taken to represent the education of tradesmen in general, we can see the broader relations of education to the three divisions of occupations as laborers, tradesmen and professional men. A boy with no education at all, or even with as much as a third or fourth grade education is practically condemned to the life of a laborer. From a third or fourth grade education on up but with less than a seventh grade education the chances for his becoming a journeyman

tradesman only, are greater than his chances of becoming an expert tradesman. With better than a seventh grade education his chances are greatly in favor of eventually becoming an expert tradesman. And, finally, if he would be a professional man it is necessary that he acquire a college degree. That these statements are true only for the general type of man found in these divisions is clearly apparent. No one at all acquainted with the general type of laborer would maintain that by spending twenty years in an effort to educate him through college could one make a professional man out of him. He lacks the general intelligence of the professional man. And, on the other hand, not all men with college degrees make successful professional men, nor even always successful tradesmen; nevertheless a college degree is generally good industrial insurance.

PRINCIPLES UNDERLYING THE CLASSIFICATION OF MEN [1]

By TRUMAN L. KELLEY, Teachers College Columbia University.

PART I.

The opportunity to appear before this body suggested making a report upon some one of the phases of army work with which I have been connected, or of presenting certain conclusions and principles which have been developed or strengthened by my total War Department experience. I have chosen the latter course because I believe my report will be of more value if I present some of the principles of selection underlying war procedure which are equally applicable to peace conditions. My experience in connection with tests for illiterates, trade tests, and the selection of ground and flying school men, entirely supports the conclusions which will be reported, but I shall choose another field, that of selection of officer material from S. A. T. C. units, to illustrate the points made, because, in my judgment, the principles adopted in the selection and classification of S. A. T. C. men are in advance of those used in any other field of classification. The problem of classification in the Students Army Training Corps followed directly from its main purpose which was to provide for the securing of material fit for officer training.

It was anticipated that from thirty to forty thousand men a year would be selected from the S. A. T. C. units for transfer to training in officers' training camps. Not only was it necessary to select these men, but it was desirable to assign them for training to those branches for which they were best fitted and in which they were most needed.

Had proverbial methods for handling a case like this been followed each corps would have conducted a separate and intense recruiting campaign in the S. A. T. C. units—the corps first on the field or the one that held out the most alluring picture of the life of its officers getting the cream of the men, to the disadvantage of other corps and resulting in a net de-

[1] Part 1 was first presented in an addresss delivered at the Baltimore meeting of the American Psychological Association under the title "Principles Underlying the Classification of Men in the Students Army Training Corps." Part 2 is presented here for the first time.

crease in the efficiency of the army as a whole. It would also be expected that in lieu of objective methods personal bias of one sort or another would be largely operative in determining recommendations for officer training schools.

In addition to securing general officer material it was contemplated that quite a number of specialists, bacteriologists, chemists, ordnance experts, etc., would be drawn from the S. A. T. C.; also, that thirty or forty thousand men fitted for training in schools turning out non-commissioned officers would be found and that those remaining after these selections would be assigned as privates to regular line units.

This was the situation which Dr. Thorndike was called upon to solve. Accordingly the scheme which he drew up aimed to do the following things:

1. Pick specialists.
2. Divide the soldiers into three parts upon the basis of general merit as officer material, the upper part going to officers' training schools, the middle part to non-commissioned officers' schools, and the least meritorious part to camps, continuing upon the status of privates.
3. To do away with the necessity of each corps conducting a separate recruiting campaign.
4. To reduce to a minimum the tendency to exercise personal bias.
5. To be just to the soldiers, both from the standpoint of their abilities and from that of their interests.
6. To determine scores for each man selected for officer material indicative of his respective degrees of fitness for the different branches of the army.
7. To lead to an allotment of officer material to the different branches which both in number and quality would be appropriate to their needs.

The solution to so complex a problem demanded a procedure involving the closest synthesis between the abilities of men, the special needs of different branches of the service, and the numbers required in the branches.

The determination of whether a man is possessed of the special training necessary to fill a specialist job is not a difficult task, so that it was relatively easy to provide for the selection of these men. According to Dr. Thorndike's scheme, these were to be selected before the further classification was done.

The division of the remainder of the soldiers into three groups, and their classification for different branches, depends upon securing accurate ratings upon traits essential to general

fitness and distinctive of such capacities as are especially required in the different branches of the army. Dr. Thorndike's original plan, therefore, provided for rating a man in the following twelve qualities:

1. Command of men
2. Popularity
3. Military studies
4. Military practice
5. Intellect, including academic studies
6. Athletics
7. Athletic—mechanical ability
8. Business ability
9. System
10. Physique
11. Character
12. Scrupulousness

These qualities were chosen because (1) each one was essential in at least one of the branches of the service for which selection was to be made, (2) it was possible to secure fairly reliable ratings for each of them, and (3) in the main they measure quite discrete talents. Due to the withdrawal of certain branches of the service from those drawing from the S. A. T. C. the number of traits was later reduced to seven as follows:

1. Intellect, including academic studies
2. Character
3. Military studies and practice
4. Physique and athletics
5. Command of men
6. Athletic-mechanical ability
7. Scrupulousness

In order to secure ratings upon these traits provision was made for a Rating Board, and in order that the rating should be as reliable as possible these principles served as a guide in determining membership and procedure.

1. An average of a number of ratings is more reliable than a single rating and is less liable to be determined by personal bias.

2. An average of independent ratings is more significant than a concensus of opinion reached after discussion.

3. In order to be accurate, ratings must be made by men who are intimately acquainted with the daily lives of those rated.

4. In order to be amendable to interpretation, ratings when made by different men must be upon the same scale.

In order that men with the peculiar talents necessary for the different branches should be so assigned, a bidding for talents, i. e., for the twelve traits listed above, by the officers in charge of recruiting in the different branches, was secured. Each branch was entitled to one hundred units of talent and could divide them among the twelve traits listed in such proportion as it judged to be most advantageous to the particular needs of its corps.

Each man was given a score in each branch of the service, which was the sum of the products of his scores in the various traits and the bids for these traits as made by each corps. To these certain amounts were added on account of the man's individual preference, resulting in final fitness scores for each branch.

Finally an allotting plan provided in substance for the assignment of each man to the branch for which he was best fitted, unless the quota in such branch was filled, in which case he was assigned to the branch for which he was next best qualified.

This brief outline presents the problem which demanded solution and the principles which were quite evidently followed by Dr. Thorndike in meeting it. With this concrete plan before us we may turn to a consideration of such principles of selection as are universally sound.

Accurate classification depends upon the securing of such measures of fitness, before the men have been called upon to demonstrate their fitness by actual performance, as will correlate highly with the excellence of the later performance. The only method of proving that the classification is accurate is by finding a high degree of correlation between the diagnostic measure and the measure of performance.

But before there can be proof there must be something to prove and it is with a view to suggesting kinds of tests and measures that offer such promise as to make it worth while to test them out, that the factors making for high correlation will shortly be enumerated.

I would ask you to note that the method of proof is straightforward and yields conclusive evidence, and in order to keep the issues of this paper perfectly clear it is hereby disclaimed that any of the principles presented for judging of the appropriateness of diagnostic measures provides a second method of proof. They constitute suggestions as a guide in drawing

up tests in the first instance and criteria to use in estimating the excellence of measures where *proof* is impossible.

The facts of partial correlation show us that when measures of any sort are used together, i.e., their results summed, to obtain a single score diagnostic of some ability, three conditions as to the relationships of the separate measures determine their excellence. These conditions determine the magnitude of the partial correlations between the separate tests and performance, and are, other things being equal, (1) the higher the reliability coefficient of the test or measure the better, (2) the higher the correlation between the measure and performance the better, and (3) the lower the correlations with the other measures with which it is to be combined the better. More briefly; high reliability, high correlation with demonstrated efficiency, and low intercorrelations are the characteristics of a good diagnostic measure. This can be made clearer by an illustration.

Suppose the capacity to be measured is fitness for training as an infantry officer. Suppose scores in the following have been suggested as constituting a good set of diagnostic measures: (1) school marks; (2) teachers' estimates of general intelligence; (3) drill masters' estimates of courage; (4) drill masters' estimates of ability to command men; (5) grades received in military drill; (6) teachers estimates of character; and, (7) estimates made by students themselves of the degree of their interest in performing the duties of an infantry officer. The significance of each of these measures can be determined if records showing efficiency in a camp for infantry officers are available, in the case of men for whom the above scores were determined. The existent conditions of reliability, correlation, and intercorrelation determine this significance for each of the tests. For example, if the estimates of general intelligence are (a) fairly reliable, (b) correlate quite highly with demonstrated efficiency and (c) correlate still more highly with school marks and estimates of character and quite highly with the remaining four traits, they will turn out to be fair or poor, but not good measures for the purpose in hand. It is the high intercorrelations which prevent their being excellent measures.

These well known facts of partial correlation have been dwelt upon because they furnish the key for judging of the value of a test when the measures of demonstrated fitness are not available. It is probable that it is always possible to make more accurate estimates of the reliability of a test, its correlation with the ultimate criterion, and its intercorrelation, than

it is to estimate directly its value as a diagnostic measure. Thus if it is impossible to secure demonstrated fitness measures, and therefore the only method possible is that of estimating significance, a very much more reliable estimate can be made if it is based upon three estimates—one of reliability, one of correlation with the criterion, and one of independence—each of which is more or less within the experience of one familiar with test and mental relationships, than if made independently.

This guessing method however can usually be improved upon, for generally actual coefficients of reliability and coefficients giving the intercorrelations are easily secured, even when it is out of the question to secure measures of correlation with real efficiency. In this case estimaes as to the latter only, need to be made.

At times a knowledge of reliability and intercorrelation may solve the whole problem so far as the single test is concerned. If, in the example cited, the coefficient of reliability for estimates of courage should turn out to be .10 or less—and the determination of this coefficient is a very simple matter—these measures can be immediately discarded as being practically worthless; and this in spite of the fact that courage itself may be the most important trait for an infantry officer to possess. Again, if the correlation between drill masters' estimates of ability to command men and grades received in military drill should be .95 or above, it would be immediately apparent that nothing was to be gained by keeping both measures and one could be discarded.

Without stopping to consider each of the seven traits, it may be pointed out that probably the estimates of interest made by the students themselves stand high as judged by each of the three criteria and accordingly such estimates may be expected to be highly important in diagnosing fitness for officer training.

The problem cited, tho neither more nor less difficult than the ordinary vocational selection problem, shows the difficulties in approximating, without knowledge of the partial correlations, the importance of a measure. Too many relationships are involved to permit of a really accurate evaluation by means of logical analysis alone. But, as mentioned, the *attempt* to estimate and interpret *all* the relationships relevant to partial correlation is particularly serviceable in *suggesting* measures which may be expected to prove valuable, since of course a method involving proof is not available at this stage of the procedure.

To this point I have considered the means of determining the excellence of measures of individuals as evidence of fit-

ness for some one particular job. I shall now consider the excellence of measures of success in jobs as evidence of the possession by individuals of certain traits. Before, the question was to judge of the probable degree of success in a job of a man with certain known, i. e., measured traits; now the question is to determine the probable degree in which a trait is possessed by a man who has known measures of job successes to his credit. This question is not merely an academic one, for it must be solved in some way wherever a certain number of men are to be allotted to a number of different jobs. The principles of partial correlation are operative here as before. Just as a number of men with various standings in several traits show different degrees of efficiency for one job, so *one* man will show different degrees of efficiency in a *number* of jobs. The method of determining which of the several jobs he will best fit is in theory just the same as the preceding, interchanging the variables. In actual working out it would not be as simple as implied but the details need not here concern us.

If the two processes are welded into one and made a single analytical function we have the solution to just such a problem as that of a firm having 100 vacancies in different departments to be filled by 100 men, each man being sufficiently meritorious to warrant some position.

If the vacancies are all of equal importance the best solution would be that which would result in the minimum number (or more accurately amount) of displacements of the 100 men—displacements to be measured in some such way as the number of transfers from one position to another until a position is found which is filled in an excellent manner. As positions ordinarily are not of equal importance, but roughly of an importance represented by the salary paid, a close approximation to the best placement of the men would be that which would result in the minimum number of dollar displacements—a dollar displacement being obtained from individual displacements by multiplying each of the latter by the respective salaries involved. It is obvious that some such weighting of individual misplacements is needed for it is much more serious for a $25 a day executive to be in a position that he is not fitted for than for a $1 a day messenger to be so placed. The problem can be readily expressed in terms of the method of least squares, or minimum errors, tho its solution statistically is complicated.

Through the genius of Dr. Thorndike a solution to this very problem evidently based upon the principles of partial corre-

lation where possible and empirical where necessary, has been most successfully attempted in his scheme just described for the selection and classification of S. A. T. C. men. His problem was not quite as general as above depicted, for in a practical sense it may be assumed that all officerships of the same rank are of equal importance, i. e. it is just as serious from the standpoint of army efficiency to have an inefficient lieutenant in the infantry as in the signal corps. The Committee on Education and Special Training of the War Department has a few copies of the scheme, as it was revised by a Committee of Supervisors of Personnel Methods and as altered in certain details by the administrative officers of the Committee on Education and Special Training, which can be obtained by those interested. In the form presented it is probably slightly less sound theoretically than as left by Dr. Thorndike, tho simpler in administration. The capitulation of Germany prevented this scheme from being put into general operation. It was however tried out in two institutions with very satisfactory results.

To summarize the salient features—it involves:

1. A method of elimination from consideration of such men as are not fit for any officer post.
2. A rating of men with respect to possession of certain traits—traits which promise to be important when judged by the criteria previously mentioned.
3. A rating of officer jobs in the different branches of the army with respect to the needs of the branches for men possessing the given traits.
4. A scheme for utilizing these ratings in allotment whereby the men would be best placed and the jobs best filled considering the total supply of available officer material. The aim was to make misplacements a minimum, in fact that there should be no misplacement whatever except as inaccuracies in the original ratings just mentioned should lead to it.

Items (3) and (4) are original contributions to the problem of classification and as I interpret them, are in harmony with well established statistical principles for a fitting of talent to need.

The possibility of utilizing such a scheme for peace purposes in industrial and educational classification is far-reaching, for every man is better fitted for some one place than any other, tho of course this will occasionally be no more honorable than a place in an institution for the feeble-minded. The

discovery of this 'best place' for an individual is an obligation which is definitely thrust upon the psychologist to solve.

Part II. The Analysis of Capacity.

It has been shown in the preceding part that a proper fitting of talent to need is only to be accomplished when the job analysis and the individual analysis show that there are fitting degrees of talents in the individual to meet established needs in the job.

This part will concern itself with the lines along which job analysis on the one hand and individual analysis upon the other should proceed. The categories into which the elements involved in either analysis may be divided, are not so distinct as to be invariable, but certain divisions will prove of greater utility than others. What these are in detail depends upon the task for which selection is to be made. There are, however, two fields for which men are selected which are so different as to make it necessary to consider them separately. They are selection upon the basis of acquired habits, such for example as on the ground of trade skill, and selection upon the basis of ability to learn, such as selection for special training in trade or other schools. Occasionally selection involves both of these bases, but as the criteria for judging of the fitness of tests or methods are different in the two cases, and as commonly but one basis is marked in any given problem of selection, the two will be considered separately.

As an illustration of the relative independence of the two types of selection in practical work, it may be noted that the Army Literacy Test and the Army Trade Tests select upon the basis of attainment, while the Army Intelligence Tests, the Scott plan for rating officers, the Thorndike plan for the selection of ground and flying school men, and the Thorndike plan for the selection of S. A. T. C. officer material, endeavor primarily to differentiate upon the basis of ability to learn.

Before considering these two kinds of selection the value of attempting a task analysis at all needs to be supported, for if efficiency in a large number of common tasks is altogether measured by the degree in which some single function, let us call it general intelligence, is present, and if general intelligence is a single thing a measure of which can be approximated in one or more ways, then it is quite superfluous to analyze the task, for such analysis could only result in revealing different ways in which the single capacity operates. Without becoming involved in theoretic considerations, it may be noted that there is a pragmatic acceptance of the single mental function theory wherever there is an acceptance of an intelli-

gence test, such as the Binet test or the Army Intelligence Test, as a means of differentiating between abilities practically irrespective of the purposes to be served. Whether a general intelligence measure is all sufficient is a question which does not need to be left to opinion, for it is merely a statistical problem to determine the degree of correlation between a task and measures which very evidently are not intelligence measures; or, if in part measures of intelligence, to determine the partial correlations involved.

Measures other than of general intelligence have been found to correlate with success in a very large number of lines. That it may be expected that such measures exist for all the important activities in life is supported by the very partial degree to which general intelligence determines the vocation which one selects. To illustrate: In a pamphlet entitled Army Mental Tests, distributions in Army Intelligence Test scores for men following different vocations are given by the Division of Psychology of the Surgeon General's Office. These data are presented in the form of a chart giving for each vocation the lower quartile, median, and upper quartile scores. The median score of 'laborers' is lowest and of 'engineer officers' highest. From this chart it is possible to closely estimate the spread in the scores for each group and for all the groups combined. If the standard deviation of the scores for all groups combined, weighted as frequencies in civil life warrant, is taken as 1.00 it is found by scaling and simple calculation that the standard deviations for the separate vocations do not vary greatly and are approximately $\frac{7}{8}$. This large standard deviation for the separate vocations, taken in conjunction with the fact that the Army Intelligence Test has a reliability coefficient of about .97, proves that factors other than general intelligence are very largely operative in determining selection of a vocation. (In this discussion 'general intelligence' is used synonymously with 'Army Intelligence Test score.') The mathematical proof of this statement is accomplished by securing measures showing the relative importance of general intelligence and other factors entering into selection of a vocation. [2]

[2] As the proof of this statement depends upon certain facts of partial correlation, one not acquainted with them may skip the mathematical analysis, simply noting the values of the final coefficients of correlation obtained and given at the end of the paragraph. The following formulae, given in Yule, G. Udny—*Introduction to the Theory of Statistics;* Kelley, Truman L.—*Educational Guidance;* or Kelley, Truman L.—*Tables to Facilitate the Calculation of Partial Coefficients of Correlation and Regression Equations* (out of print); are utilized:

It may help in following the illustration to think of the vocations as ranking in the accompanying order, which is that given by the Army Intelligence Test scores, altho the true ranking would be on the basis of the sum total of abilities, interests, wages, geographical positions, etc., etc., which determine participation in a vocation:

Laborers
Tailors
Cobblers
General miners
:
Painters
General blacksmiths
Bridge carpenters
:
Telegraphers
R. R. clerks
Filing clerks
:
Medical officers
Army chaplains
Engineer officers

Let us designate by a variable, x_1, position of any vocation in such a true ranking. Let us designate by x_2 intelligence test position and by x_3 position in a composite of *all* the *other* factors which determine an individual's selection of a vocation. x_1 is related to x_2 and x_3, using the usual regression equation notation as follows:

1. The regression equation involving three variables:

$$x_1 = b_{12 \cdot 3}\, x_2 + b_{13 \cdot 2}\, x_3$$

2. The standard deviation of the errors of estimate in the case of three variables:

$$\sigma_{1 \cdot 23} = \sigma_1 \sqrt{1 - r^2_{12}} \sqrt{1 - r^2_{13 \cdot 2}}$$

3. The value of a partial coefficient of correlation:

$$r_{12 \cdot 3} = \frac{r_{12} - r_{13} r_{23}}{\sqrt{1 - r^2_{13}} \sqrt{1 - r^2_{23}}}$$

4. The standard deviation of the errors of estimate (or of the arrays) in the case of two variables:

$$\sigma_{1 \cdot 2} = \sigma_1 \sqrt{1 - r^2_{12}}$$

$$x_1 = b_{12 \cdot 3} \; x_2 + b_{13 \cdot 2} \; x_3$$

and since x_3 comprises *all* the factors other than general intelligence which affect vocational choice, x_1 is completely determined when x_2 and x_3 are known, i. e., $\sigma_{1 \cdot 23}$, the standard deviation of the errors of estimate, would in that case equal 0. However,

$$\sigma_{1 \cdot 23} = \sigma_1 \sqrt{1 - r^2_{12}} \; \sqrt{1 - r^2_{13 \cdot 2}}$$

and this can only equal zero in case $r_{13 \cdot 2} = 1$. Accordingly,

$$r_{13 \cdot 2} = \frac{r_{13} - r_{12} r_{23}}{\sqrt{1 - r^2_{12}} \; \sqrt{1 - r^2_{23}}} = 1 \quad \text{Therefore,}$$

$$r_{13} - r_{12} r_{23} = \sqrt{1 - r^2_{12}} \; \sqrt{1 - r^2_{23}}$$

Since x_3 comprises factors *other* than x_2, x_2 and x_3 are completely independent, or $r_{23} = 0$, and the last equation becomes,

$$r_{13} = \sqrt{1 - r^2_{12}}$$

r_{12} may be determined from the standard deviations reported above, since

$\sigma_{2 \cdot 1} = \sigma_2 \sqrt{1 - r^2_{12}}$, in which $\sigma_{2 \cdot 1} = \frac{1}{4}$ and $\sigma_2 = 1.00$.

Solving, $r_{12} = .484$, the correlation between general intelligence and vocational choice. Continuing,

$$r_{13} = \frac{\sigma_{2 \cdot 1}}{\sigma_2} = .875^3$$

This is the correlation between the 'other factors' and vocational choice. As its derivation has shown, it is essentially a function of x_1 and x_2, since x_3 has only been introduced for the sake of the argument and is not a known factor, and just as .484 is the coefficient of correlation between intelligence and vocational choice, so may .875 be called the coefficient of alienation between the same two things. If we designate this coefficient by k_{12} the simple relationship, $k^2_{12} + r^2_{12} = 1$, always holds.

In view of this high correlation between these other factors and vocational choice it is eminently worth while to attempt to discover what they are, and not rest content with such light as measures of general intelligence alone give for vocational or educational guidance. A task analysis should throw light upon what constitutes this very large field which is not general intelligence but which correlates with vocational selection to the extent of .875.

[3] If the reliability of the Army Intelligence test, .97, were taken into account this figure would be a trifle lower.

For the successful pursuit of a trade (a) certain habits are demanded, (b) certain concrete items of information, (c) a certain degree of initiative and originality—typically represented when a worker is called upon to decide which of his trade habits is appropriate in a given new situation, and (d) in addition to these elements of ability there must be a certain willingness to perform the duties of the trade—in other words certain increments of satisfaction must result from their performance in order to insure perseverance and contentment.

(a) The measurement of habits is readily accomplished by means of performance tests involving the habits in question. In a trade test it is not feasible to actually measure each of the habits exercised by one proficient in a trade, so a sampling of the habits is resorted to. Certain samplings are much better than others which require the same amount of time. That there may be a sharp differentiation between trade and trade, the particular habits sampled should be as typical of the specific trade as possible; as largely dependent upon habit and as little dependent upon general common sense as possible; as closely allied to habits not measured but involved in the trade as possible; while at the same time they should be as unlike the other habits which are measured as possible. Meeting these conditions will insure that the field of the trade is covered and not simply that some small portion is measured again and again, and that the test does not measure concrete items of information or initiative, each of which can be much more expeditiously and accurately measured by verbal or written tests. Of course such considerations as material and time available for testing, and ease and accuracy of scoring also enter in. If the time available for testing is short satisfactory results can not be expected from a performance test, i. e., a test aiming to ascertain the efficiency of trade habits. A verbal or written stimulus is adequate to call forth specific items of knowledge, but a habit is ordinarily set off by a situation brought about by the worker himself in the performance of a routine. It takes skill and much time to involve the worker in such situations as will betray the trade habits which it is desired to examine. This is particularly true if it is desired to measure a number of habits in a single test. As a consequence it is not to be expected that a short trade test of an hour's duration will correlate as highly with efficiency as a fifteen minute oral or written test measuring concrete information; and in fact this situation has been repeatedly reported as existing in the case of different army trade tests. However this changes rather than lessens the importance of the performance

test, for, if carefully devised a second hour in a performance test can be made to yield almost as much new relevant information about a man's trade skill as the first hour; whereas a second fifteen minutes in an oral or written test gives a very decidedly decreased return from that of the first fifteen minutes. In all probability, given excellent tests in both cases, some such elation as this holds:

A 15 minute oral test gives more information as to trade skill than a 15 minute performance test.
A 1 hour oral test gives more information as to trade skill than a 1 hour performance test.
A 2 hour oral test gives equal information as to trade skill to that of a 2 hour performance test.
A 4 hour oral test gives less information as to trade skill than a 4 hour performance test.

That the criteria for judging of the excellence of a trade test enumerated in the preceding paragraph are not generally accepted by people actually making selections, was forcibly brought to the attention of the writer by a civil service examiner who said that he could tell by the way in which an acetylene welder picked up his torch, his degree of skill. The writer, as a witness to just such an examination, listened attentively to the examiner's definite and assured description of the workman's ability, and being both a guest and a novice in welding, expressed great interest in the examination though mentally noting that several trades involve handling torches; that the picking up of a torch is hardly a matter of habit, as the location of the work with respect to the torch varies with the job; that the degree of merit shown in the picking up process is entirely a matter of the subjective opinion of the examiner; etc., etc. However, to date the case is in favor of the examiner, for neither he nor the writer has ever been told that the man did not have the exact degree of skill attributed to him. The man, the examiner, and the writer have, like gentlemen, refrained from concerning themselves with each other's business.

This story is typical and not exceptional, for every examiner, be he a trade tester or a college professor, who does not check up on his classification by studying the later performance of those clasified, is confirmed in his procedure though it contain essentially and easily ascertainable erroneous devices. The less the test, in its giving and scoring, (but not in its derivation) depends upon the trade expertness of the examiner, generally the better—certainly the better from the standpoint of objectivity and uniformity or reliability of measurement.

(b) The measurement of specific items of information which are pertinent to a trade can be accomplished by means of an oral or written questionnaire, or by other means such as appropriate picture completion tests. Certain important difficulties may be mentioned: One is due to the fact that trade terms are very fluent—the word "plug" probably means a score of specific things in as many trades, and probably also no single one of these twenty "plugs" is universably known by that name. Another difficulty is due to the fact that foreigners have a different nomenclature—one which is not a literal translation of the English. Another is due to the difference in procedure in different parts of the country—carpenters trained in New York, Georgia, and California will answer the question "What is done first in building a house" in very different ways and each in a way which is right according to his training. Another is due to the ease with which people can be coached upon items of specific information—an individual with the barest trace of literacy can be taught to correctly answer the following written questions: "What is your name?" "In what country were you born?" "In what State in the Union is your domicile?" "Has your abode been restricted to the confines of the aforementioned habitat for a decennium?" Coaching is nearly as easy in other specific information tests. Questionnaires based upon pictures and involving few words (extensively used in the Army Trade Tests), picture completion tests, and picture matching tests seem to be as little subject to the diffculties mentioned as any.

(c) The measurement of such initiative and originality as is needed in a trade may be approached in a number of ways, all more or less similar to the usual means of measuring general intelligence. A specific variation from this which promises to yield exceptional return, is that of making trade material and procedure the content of the test rather than the usual general intelligence material which is considered to be common to the experience of Americans. Reasoning tests involving engineering material were used by Thorndike in his study of Engineering ability, (conducted for the Carnegie Foundation for the Advancement of Teaching, report of which is published by the Foundation) with very satisfactory results.

(d) There is little reason to believe that the measurement of interest should prove a serious obstacle in the case of trade testing, for it should be possible to ascertain by means of a questionnaire the degree of satisfaction which in the past has resulted from the practice of the trade. The amount of satisfaction found in the work in the past and the opportunity the

trade gives for realizing present aspirations provide a prognosis for the future.

Turning from the measurement of an acquired facility to react, to the measurement of facility to learn to react, a radically different situation is presented. The measurement of concrete items of information is of no value in itself, and only becomes diagnostic of ability to learn in so far as it reveals a necesary foundation for the learning process, and in so far as the learning of concrete items in the past correlates with the ability to learn new concrete items in the future. The measurement of habits holds a similar position. Abilities (a) and (b) are of less, and abilities (c) and (d) of greater significance, than before, but the measurement of ability to learn is so different from the measurement of attainment that an entirely different division into elements is called for.

The measurement of ability to learn may properly be divided into: (a) The measurement of prerequisites, ground work, or necessary foundations upon which to build; (b) The measurement of accomplishment in itself not essential but which has been attained as a result of an activity which correlates highly with the activity necessary in learning the task in hand, e. g. if there is a high degree of correlation between the ease with which an American can learn French and the ease with which he can learn Chinese, a measurement of the time spent in learning French and facility acquired would give evidence as to the probable success in learning Chinese; (c) the measurement of ability to learn the new task by tests which are as nearly as possible samples of operations demanded in the task itself; and (d) the measurement of interest.

(a) The utility of a measurement of prerequisites must be considered in connection with the question of transfer of training. It has been thoroughly demonstrated in the training of mechanicians and engineering officers in the army that a great many of the foundations assumed in peace times to be necessary for proper training are unessential. The writer has seen commissioned and non-commissioned officers taught the theory of the internal mechanism and of the explosive charge of the hand grenade, on the assumption that these were necessary to the proper manipulation of the grenade in warfare. Other army experience has shown the futility of this. Though the case cited is more extreme than ordinarily found, it is to be expected that the same sort of absurdity maintains in every field in which extreme press of circumstances has not led to the ascertainment of what constitutes the real essentials. This condition has a parallel in the measurement-of-fitness field,

for there is a very large amount of examining which, in so far as it results in reliable measures, yields measures of traits which are not essential to the task examined for.

The question as to the essential or non-essential nature of a foundation is to be answered by partial correlation, i. e. by calculating the extent to which excellence in this ground work, *other things being equal,* is evidence of fitness in the task. Simple correlation of excellence in the ground work with success in the task is not evidence that the foundation chosen is a true prerequisite for the task, or even that knowledge of the foundation is evidence of probable fitness in the task, if other measures of fitness are to be used at the same time. In spite of these objections, the difficulty of securing under ordinary test conditions true samplings of a new task, and the relative ease of securing measures of success in past attainment, warrant the expectation that this method, if very judiciously used, will yield valuable information.

(b) The precautions consequent to the limited degree in which training transfers, mentioned above in connection with utilizing knowledge of prerequisites, are equally necessary in utilizing measures of attainment in tasks not a part of the task under investigation, but supposed to be dependent upon the same sort of mental capacity as is this task in question.

(c) There is no doubt that the ability to expeditiously learn to do a sample of a task, correlates very highly with the ability to learn to do a lot of such samples—i. e. the task itself, should it be entirely composed of such samples. The individual who can quickly memorize the connection between "house" and "domus" will be adept in memorizing one thousand such. Surely no prognosis of ability can be better founded than that based upon performance in a thorough sampling of the task; but ability alone does not determine fitness, for fitness is indissolubly connected with interest.

(d) An individual who takes interest in a test involving memorizing ten foreign words and stands high in it may be very averse to memorizing five thousand such and even still more averse to regularly practicing such an ability in translating the literature of a foreign language. Interest in learning under test conditions; interest in learning under school or apprenticeship conditions; and interest in the repeated and routine exercise of the association formed under ordinary vocational conditions, are distinct things which cannot be expected to correlate to a high degree. As an actual illustration, the case may be cited of a young man who in three months learned a trade, ordinarily accomplished thru a four years' apprentice-

ship. He practiced the trade as a journeyman for two months and then left to take up work giving opportunity for training in a profession rather less remunerative than the trade, showing that in spite of interest and ability in the learning process, there was little interest in the routine exercise of the thing learned.

It may be roughly true that the greater the ability to learn the greater the interest in learning, but this does not imply the greater the interest in repetition after learning. Initiative and originality lead to satisfaction in the learning process, but to annoyance in the routine repetitive process. From the standpoint of interest there must be a happy degree of initiative and originality for each vocation—just enough to lead to such satisfaction in the learning of the vocation as to carry the individual through the difficulties of learning but not so much as to make the annoyance of routine performance unbearable.

The preceding paragraph has considered interest as related to ability, for initiative and originality are largely intellectual factors capable of measurement. There are also interests definitely related to other abilities, such as interest in music, painting, etc., etc. Interests other than those dependent upon ability presumably exist and of course influence readiness to learn and to follow a given line of work. Their direct measurement seems almost impossible but in so far as they are constant and will operate in the future as they have in the past, their influence can be approximated by ascertaining the degrees of satisfaction which have accompanied learning and routine occupations of various kinds in the past.

In recalling the traits needed for the successful performance of a trade and those needed for the successful learning of a new task it will be noted that general intelligence is only approximately synonymous with initiative and originality in selecting appropriate trade habits, and with ability to learn new tasks. The other factors may be expected to be in part, possibly in large part, those which correlate so highly (.875), with vocational selection.

THE PRACTICAL "EFFICIENCY" OF A GROUP SCALE OF INTELLIGENCE

STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF INDIANA UNIVERSITY

By S. L. Pressey and L. W. Pressey

I. *The Standardization of Tests of Intelligence in Terms of Their Uses.*

In the September number of the *Journal of Applied Psychology* the writers described a group scale of intelligence for the measurement of the native endowment of school children. The scale has thus far been employed for two purposes (1) to aid in a census of the feeble-minded children in the schools of a certain Indiana county— this as part of a "mental survey" to determine the number of children needing institutional care in the county—and (2) as an aid in sorting children, according to ability, in the public schools. The present paper aims to present some facts relative to the efficiency of the scale as a whole, and of its separate parts, for these two purposes.

It should be pointed out at once that such a method of evaluating tests of general intelligence—obvious as it is—is somewhat unusual. The Binet and Point Scales have made us familiar with methods of estimating, more or less directly, mental ability in terms of amounts of development. The scales have been standardized by determining the average performance of children of different ages. And the value of a given test has commonly been estimated by the extent to which it distinguishes the average child of one age from the average child of another age.

Tests may also be evaluated by correlation with the results from a large group of other tests of high differential value. Standardization in terms of mental development is, if we may trust recent experimentation,[1] not wholly relevant to the problem. Tests which are differential of chronological age

[1] Brigham, Carl C. Two Studies in Mental Tests. *Psychol. Monographs*, Vol. 24, 1917, No. 1, p. 245. Doll, E. A. A Brief Binet Simon Scale. *Psychol. Clinic*, Vol. 11, 1917, pp. 197-211 and 254-62; also Pressey, S. L. and Cole, L. W. Are the Present Psychological Scales Reliable for the Use with Adults? *J. of Abn. Psychol.*, Dec. 1918.

are not necessarily the tests which are differential of degrees of mental ability at a given age. And evaluation of a test, by correlation with the results from a group of other tests, results in an "inbreeding" which may have the advantages, but certainly has also the dangers, incident to in breeding in the biological field. Doubtless a more refined mathematical handling may avoid such a danger, and give us our final method for evaluating tests of "general intelligence." But meanwhile it is interesting to see whether it may not be possible, by simple and more direct methods, to obtain some indication of the efficiency with which such tests serve two of the many purposes for which such scales are ordinarily employed.

The present paper will take up in order three questions. First, what is the efficiency of the group scale used, as a whole, in separating out from a total school population (a) feeble-minded of institutional grade, and (b) those children who are sufficiently subnormal or brilliant to deserve special educational treatment? Secondly, what is the contribution of each test in the scale to these differentiations? Finally, what is the efficiency of certain of the most differential of these tests, when grouped into a brief scale, for the purposes above mentioned, as compared with the whole scale?

The scale was first used as a means of first selection of cases, in a mental survey made to determine the number of mental defectives, needing institutional care, in a certain Indiana county. In order to find out what ratings, on the scale, ought to be considered suggestive of such mental defect, the simple expedient was adopted of surveying with the scale, the state school for the feeble-minded. The scale was, however, planned chiefly as an aid in discovering those school children who, because of exceptional dullness or exceptional brilliancy deserve special educational treatment. In order to determine how well the scale performed this service a special class for gifted children and a special class for subnormal children in Louisville, Kentucky, were examined, and retarded and accelerated children in the Bloomington, Indiana schools were compared—these two groups being taken to best represent, in a system not having special classes, the school's judgment as to those capable of superior work or not capable of doing the work of the average child.[2] A rough measure has

[2] 6-8 was taken as normal for the first grade, and so on up. With this standard, retardation and acceleration are phenomena sufficiently abnormal to have a definite significance as indicative of a child's mental capacity. Age at time of examination was used, this being considered satisfactory for the purpose in hand.

been obtained of the completeness with which the scale sets these special groups apart from the group of average children.

The study is based on results from 986 Bloomington, Indiana, school children, 200 cases at the state "School for Feeble-minded Youth," 23 children in a class for gifted children, and 25 in a class for subnormal children at Louisville. Data from two other cities surveyed (a total of nearly 2,800 cases) will also be referred to.[3]

II. *The Differential Value of the Scale as a Whole.*

Let us first examine the efficiency of the scale as a means of first selection, in the public schools, of cases sufficiently defective to need institutional care. The relation of the scores obtained at the state "School for Feeble-minded Youth" to the total distributions of scores for the Bloomington children may be indicated very briefly.

All cases in the institution, with the exception of a few adult "boys" living on a branch farm, who were sufficiently literate to take the examination (that is, all cases who had advanced beyond the second grade) were tested.[4] Of the total 416 cases in the institution 11-18 years old, only three made a rating above the lowest ten percentile for the school children of the same age. One of these three has a Stanford-Binet I. Q. of 78, for the others no ratings are available. One is eleven, the other two are brothers aged twelve. All three are orphan asylum children; the best children come, they say at the school, from the orphanages. There are only five cases rating above the five percentile for the school children. Of the thousand odd cases over eighteen, again three rate above the ten percentile for sixteen. One of these has an I. Q. of 81, another of 85. All three are delinquent girls.

Such results seem to be evidence of some definiteness that the scale measures general intelligence, if we define general intelligence as an intellectual quality lack of which, to any considerable degree, requires that the individual concerned be placed in an institution, and possession of which enables the

[3] The writers wish to acknowledge their obligation to Dr. George W. Bliss, Superintendent of the Fort Wayne "School for Feebleminded Youth," to Miss Henrietta V. Race, school psychologist in Louisville, and to the school officials and teachers of the systems studied, for the opportunity to obtain these data, and for their help and interest in the work.

[4] It should be added that all doubtful cases were also given the examination, and that some fifteen papers were thrown out, the examinations showing little that could be considered other than chance successes.

individual to continue in the environment. The scale distinguishes quite definitely these two groups. It should be said that the particular institution surveyed possesses a smaller number of young high-grade defectives than certain eastern institutions with which the writers are familiar. It may very well be that a survey of one of these schools would show the scale much less clear-cut in its differentiations than it appears at present. But the scale was not being used to help in an enumeration of cases which were to be put in an institution in New York or Massachusetts. It was being used to determine how many cases, in the schools of a particular county in Indiana, were mental defectives of institution type, as that type was defined in this particular state. The statement that a certain Bloomington school girl sixteen years old scored lower than 33 of the 69 girls of her age already in the institution and that she made a total score of 15 where cases in the institution ran up scores as high as 110, surely goes straight to the point in terms no one can misunderstand. [5] It should be added that this particular survey was part of a larger study undertaken by the State Board of Charities in an effort to demonstrate the pressing need of further provision for the care of mental defectives. To carry conviction to people not familiar with the significance of findings on the Binet Scale, the statement just given is more effective than any statement of I. Q. or even of mental age might be. It surely means more to the average individual than to say merely that this girl makes the lowest score of any school child of her age in her town. It means more than the statement that she grades lowest of 268 unselected school children in the three towns surveyed. The direct comparison with the group at Fort Wayne has a most immediate practical significance which cannot be escaped.

A special class for gifted children at Louisville, Ky., had at the time the writers visited it, 23 members, eight to ten years of age. Their I. Q.s on the Stanford Binet scale ranged from 1.23 to 1.69. But more important for the purpose of evaluation of the scale, in the immediately practical ways which have been attempted, is the fact that all these children had been for a year or more in this special class, doing roughly two years work in one, and had proven their capacity for such work. These children make on the group-scale scores which fall in the highest ten percentile for Bloomington, with

[5] This girl has a mental age of six, an I. Q. of 42. She is in the fifth grade because only in this room are the seats large enough for her.

three exceptions; these three are only slightly below the ten percentile. They are the three who have the lowest mental ages.[6]

In the special class for subnormal children at Louisville three out of twenty-five make scores above the ten percentile for their age. As the class contained moral delinquents as well as merely dull children, this is not surprising.

It would appear then, from these Louisville data, that the scale was of some efficiency in separating children who have already been especially diagnosed by the school as subnormal or brilliant, from a group of average children. The differentiation is not as clear-cut as might be wished. But, taking the groups as wholes, it would seem fair to infer that the scale does primarily measure that sort of ability, possession of which, to a marked degree, makes a child capable of exceptional school work, and lack of which necessitates special educational treatment. The brilliant class averages at the 98 percentile for the total Bloomington group; the subnormal group at the 4 percentile.

It seemed probable that there would be similar groups of dull and gifted children among the Bloomington school children. But since there were no special classes the writers had to rely on the less certain phenomena of acceleration and retardation as a definite pedagogical expression, in such a system, for subnormality and brilliancy. It was the intention of the writers to consider only such pupils as were sufficiently retarded or accelerated to represent distinct deviations from the average in mental ability. Only those children accelerated or retarded a year or more (by the standard already mentioned) were therefore studied. When the scores were tabulated, the simple expedient was adopted of marking these retards into the score sheets with blue ink, the accelerates with red ink, while the other children were checked in with pencil. A picture of the relation of retardation and acceleration to group-test score was thus obtained, with practically no work beyond what might have been involved in a straight tabulation of the distributions.

It is self-evident that, since the examination was not given below the third grade nor beyond high school, there were no 8, 9, and 10-year-old retards (since these would be in the first and second grades) and no accelerates above fifteen (since these would be through high school). It was finally decided to consider only the retards from 11 through 15 and

[6] It might be added that the product-moments corellation of mental age with group-test score is .63 for this class.

accelerates from 10 through 14, because for these ages only was there sufficient opportunity for acceleration and retardation to show itself. Among the 579 cases in these five ages there were 32 cases retarded over a year, of whom 23 are in the lowest ten per cent for their ages on the total distribution. And there are, in a total of 571 cases, 47 accelerates of whom 18 are in the highest ten per cent.

It is natural that the scale should select more accurately for retards than for accelerates, since a bright child may very well do poorer work in the tests because of chance circumstances of the day or the examination, but a dull child is much less likely, as a result of fortuitous circumstances, to excell himself. The differentiation of neither group is as clear-cut as might perhaps be wished, But from another standpoint the interest of the situation is just here, and the value of such a method of dealing with results is particularly great. To take an actual case —the boy who makes the best score, of the 133 fourteen-year-olds tested, is in the grade normal for his age. His parents wish him to go to work as soon as the law permits, and the boy himself has lost all interest in his schooling. It is surely of no little help in dealing with the situation, to be able to point out that the boy shows ability on the tests above that of children of his own age who are two or three grades ahead of him in school, that he rates above the average for the senior year in high school and yet is idling away his time in the eight grade. In short, there is direct evidence to show that if he would arouse himself to the value of his school work and continue farther in his studies his efforts would undoubtedly be successful and his progress rapid. The highest score, among the eight year children, was made by a boy in the third grade. In urging that he be advanced (as his teacher admits he should be) it is surely an aid in the argument to be able to show that the child makes exactly the same score as another eight-year old boy in Louisville, who is now in the fourth grade and successfully doing two years work in one, and that in his own school there are eight-year-old children one and two grades ahead of him, who make poorer ratings than he. He rated, in fact, above the average child in the fifth grade.

So much for the evaluation of the total scale for the two purposes above mentioned, for separating out feeble-minded cases of institutional grade from the total school population, and for marking off extremes of ability in that population. Some evaluation of the individual tests of the scale remains to be made. As was stated in the previous article already referred to, the tests used in the scale were selected

with some care on the basis of their ability to differentiate dgrees of ability—ability being estimated on the basis of Binet examinations, teachers' rankings, school records and other similar data. But these estimates were made on a relatively small amount of data, and it seemed interesting to make a new evaluation. Such an evaluation was also called for by certain important failings that had already appeared in the total scale. The scale took three-quarters of an hour to an hour to give. This is too long for ordinary school work; provided a sufficient reliability can be obtained, such an examination should not take over thirty minutes, the average school period. An elimination of some tests was thus suggested. Certain tests had already proven relatively unsatisfactory, so far as ease and standardization in giving and ready scoring were concerned. However, if the scale were to be cut down by the elimination of certain tests, the question as to which tests should be eliminated ought to be settled primarily by a measure of the comparative differential value of the separate tests. The method adopted for doing this, and the results, may be indicated very briefly.

III. *The Comparative Differential Value of the Separate Tests of the Scale*

A rough indication of the contribution of each test to the differentiations above mentioned was obtained in the process of working out norms by test. The scores on each test, at each age, were tabulated for the total Bloomington group. This was very readily done, since each test has twenty items and the tests were graded, in the first place, roughly, so that at each age about the same score would be made by the average child on each test. A separate sheet of cross-hatch paper was used for each age. The possible scores (1-20) were numbered across the top; the tests from 1 to 10 down the left hand side. If a nine-year-old child made scores on the ten tests of 9, 10, 9, 8, 6, 9, 4, 3, 8, 5 respectively, his scores were recorded by making a mark at 9 in the space allowed for the first test on the nine-year chart, a mark at ten in the space allowed for the second test, etc. But before tabulating a given age the papers were arranged in order of total score for that age; the records of those scoring in the lowest 10 per cent were then tabulated by test—in black ink. The records of the middle 80 per cent were tabulated in pencil; and finally the scores of the highest 10 per cent were recorded in red ink. This gave on the tables a rough picture of the agreement of

each test with the results by total score in separating off the highest and lowest 10 per cents of the distribution at each age. If test 1 were completely differential of the lowest 10 per cent of mental ability, as defined by the total scale, then the black marks would all appear at the bottom of the distributions for test one, below the lowest pencil mark. Such a test would be 100 per cent differential, or there would be 0 per cent of error. If some of the black marks appeared above some of the pencil marks the test would be less than 100 per cent differential or there would be a per cent of error. If, for instance, on test one at year nine a black mark appears above eight pencil marks, we may say that on this particular case the first test was eight cases in error. And the average of all such errors, on each test, expressed as a per cent of error, will give a ready means of measuring roughly the correlation of each test with the total score at the extremes of the distribution.[7] The average per cent of error of each test, for ages eight through sixteen combined, for the 986 Bloomington school children, runs as follows:

Test	1	2	3	4	5	6	7	8	9	10
Lowest 10%.....	17	7	11	7	11	8	8	6	11	7
Highest 10%.....	13	8	11	8	17	12	7	10	12	7
Total Error.....	30	15	22	15	28	20	15	16	23	14

The first point to notice is that the tests which are most differential of subnormality are those also most differential of brilliancy. With one exception, the four tests most differential of the one group are most differential of the other, and, again with one exception, the least differential tests are the same. The two errors have, therefore, been combined to make a total error in differentiating the extremes. The two least valuable tests appear to be the first and the fifth. The first is a test of rote memory (the children are read lists of words such as "chalk, man, bag, book, sister" and then asked to write the word that came after "chalk"); the fifth is a test of logical memory (the class is read a newspaper passage and then asked questions about it). The most differential test is the tenth, next come the second, fourth and seventh. The tenth test is "Analogies," the fourth "Opposites." The second is "Logical Selection" (the test contains such lists as "CHAIR —arm, cushion, legs, rockers, seat" and the children are told to "underline the two things, in each list, that the thing named

[7] As may readily be seen, the caluclation of the error can be made extremely simple and rapid; the whole method is much more complicated in the description than in practice.

in big letters at the beginning of the list is *never* without."). The seventh test is " Moral Classification." (The test consists of a list of twenty words, beginning " whispering, setaling, charity, drunkenness," and the children are told to "put a '1' under words meaning something you mustn't do in school, a '2' under words meaning being good to other people, a '3' under words meaning something that is bad for yourself, and a '4' under words that mean getting things from other people in ways you shouldn't.") The fifth most differential test is the eighth, " Dissected Sentences."

It was decided to make a brief scale out of these five most differential tests. It was found on closer study, however, that the seventh test was differential only with the older children; the test permitted sufficient chance successes to blurr the results with the young children. The next test in value, the sixth, was therefore substituted (" Word Completion "—the children are told to fill in the missing leters in such words as " a .it .me .ic "). The other four tests excluded from the brief scale were the " Practical Arithmetic " test (the children were read such problems as " If you had 25 cents, and bought two erasers at 3 cents each and a bottle of ink at 5 cents, how much would you have left?"), and the ninth test (" Practical Information "—the test contains such lists as " bill, coins, check, draft, stamps," the children being asked to " put a line under the safest way to send money, and a cross after the least safe way "), and the two memory tests already referred to. It should be said that the above findings with regard to differential value were not the only factors in bringing about the exclusion of these tests. The arithmetic test was too long, and it made too many demands upon the skill of the examiner, to be easily kept constant from one examiner to another. This fault also held for the two memory tests; besides, they called for writing, and so required more time in the giving and were harder to score. The five tests finally included in the " half scale " were thus not only the most differential, but the best constructed tests as well; both criteria were used in making up the new group.

IV. *The Differential Value of the " Half Scale "*

The half scale was, then, made up of the following tests: " Logical Selection," " Opposites," " Word Completion," "Dissected Sentences," " Analogies." These are, it happens, the even numbered tests of the whole scale. It was now a very easy matter to add up the scores on these five tests, on the records from the full scale, and tabulate the distribution of

half scale scores, as we might expect those results to fall if these tests had been given separately, as a short scale.[8]

The question will be asked, whether the full scale did or did not emphasize, in its sampling of mental functions, some rather special trait, and whether a half scale made of the tests correlating most closely with the scale as a whole may not be merely a scale testing more specifically this one trait? That is, has there not been a harmful "inbreeding"? To obtain some light on this question, the writers have simply evaluated the half scale in terms of its efficiency for the two practical purposes already mentioned, in exactly the same fashion as was done with the full scale.

TABLE I.

HALF SCALE: RESULTS FROM 1022 SCHOOL CHILDREN IN BLOOMINGTON

Age	No.	10%	M.	90%	Grade	No.	10%	M.	90%
8	53	15.3	31.5	44.8	3	116	9.9	27.6	42.8
9	92	15.5	33.2	55.0	4	99	16.4	33.3	48.0
10	96	20.8	46.5	66.8	5	96	33.6	50.1	62.9
11	114	23.5	55.9	74.9	6	108	46.4	58.9	70.9
12	117	41.9	59.5	77.7	7	123	50.4	65.5	76.7
13	111	47.7	65.4	78.0	8	122	59.5	69.6	81.3
14	133	51.6	70.4	85.3	I	123	63.0	76.5	86.9
15	104	55.7	76.2	88.0	II	97	70.0	80.4	88.5
16	89	66.0	79.9	89.6	III	82	71.1	81.0	91.9
17	80	68.5	81.0	90.0	IV	56	77.4	84.5	90.3
	989					1022			

The results can be given in a paragraph. When the scores on the half scale were worked out for all the cases already mentioned, it appeared that for the first purpose mentioned, for selecting out feeble-minded of institutional grade, the two scales gave largely similar results; both scales show three Fort Wayne cases eighteen years or under rating above the 10 percentiles for the Bloomington school children, five rating above the Bloomington five percentiles. But for the second purpose, for aid in determining those children so subnormal or so brilliant mentally as to deserve special educational treatment, the half scale would appear to be, if anything, superior. The whole scale shows 20 of the 23 in the gifted class at Louisville in the upper ten per cent of the Bloomington group;

[8] We do not know, of course, that these tests would behave in the same way by themselves as when given together with the other tests. But norms thus derived may surely be expected to approximate with fair closeness the results which would have been obtained if the five tests had been given alone at least with a closeness sufficient for the purposes of the present paper. The norms thus derived are given in table I.

the half scale places 21 there. The full scale shows 22 of the 25 in the Louisville class for subnormals, the half scale 23, in the Bloomington lower ten per cent. The whole scale places 23 of the 32 Bloomington retards in the lower ten per cent for their age, the half scale puts 26 there; by the whole scale 18 of the 47 accelerates are above the ninety percentiles, 28 between ninety percentile and median, 1 below the median, by the half scale 31 are in the upper ten per cent, 16 between ninety percentile and median, none below the median.[9]

V. *Discussion*

It would seem, then, that for most purposes these five tests would be quite as efficient as the full ten of the earlier scale. They are suggested as a very convenient group for rapid surveys of schools or school systems. The tests take about twenty-five minutes to give, can be printed (or mimeographed) on two sides of a single sheet of typewriter paper, and are readily scored. The norms given above may be thought of as fairly accurate. The half scale may very likely not give so stable a measure, in individual cases, as the full scale; and it gives data much less interesting for research purposes. However, for many practical uses the five tests should prove much more satisfactory.

But the writers have been much more interested in certain general principles involved in the present study, than in any particular results which might be obtained. We very much need more intimate knowledge as to just how important the qualities tested by our tests of "general intelligence" are, in the total complex of qualities that determines social inadequacy and irresponsibility. The institution surveyed contained a much smaller proportion of "Problem cases" than is found in many such institutions, at least so it seemed to the writers. But for all that, the "children" at Fort Wayne were a very heterogeneous group, who required institutional care for a variety of reasons. The writers believe that a systematic study, beginning with a survey by means of group tests, of the total population of such an institution, would yield results of unusual psychological—and sociological—interest. Until such studies have been made we cannot know all that we should about the meaning of our test findings, when we are using our tests to aid in diagnosing "feeble-mindedness."

[9] Expressed in terms of the "average error" above referred to, the whole scale shows 5% of error, the half scale 0.9%, in differentiating the gifted class; errors are 5% and 3% in differentiating the subnormal class. And they are 6% as compared with 3%, and 5% as compared with 2% in differentiating retards and acceelerates respectively.

The checking up of our tests by study of groups of exceptional school children who have been independently selected is also worth while. Such methods of evaluation involve errors of their own, which cannot be discussed here; the Fort Wayne cases may have been "institutionalized," and the special school groups given a special training, to an extent which may have affected the results. But at least a rough indication has been, in the present instance, obtained of the significance of findings on the scale used, in terms of social inadequacy and of markedly superior and inferior educability. The results have not, perhaps, been altogether satisfactory so far as the merits of the tests are concerned. But at least (as the writers have especially tried to show) so far as the measures *are* reliable they have a much more direct practical implication than would otherwise be the case and it must always be born in mind that special groups may not be, by any means as well selected as they should be; it would certainly be quite as interesting to discover in a special class or an institution for the feeble-minded, a case which did not belong there, as to find among average individuals an abnormal case.

The present study has thus involved a special effort to relate the test findings closely to the practical problems in connection with which they were to be used. The writers cannot escape the feeling that mental measurement has been too much dominated by the concept of "general intelligence"—that the varied educational and sociological problems dealt with in such work are much more complex than is sometimes realized, and that special methods are in most instances needed for each problem.[10] A more intimate contact with the total situation in each special field seems necessary. The writers hope shortly to present data from a number of such special groups (including three institutions for the feeble-minded) with analysis by test of the differential findings.

Summary

1. The "Group Point Scale" distinguishes the children in a state institution for the feeble-minded from a large group of

[10] There was some evidence in the present study to show that the tests most satisfactory in marking off the extremes of educability among school children were not the best for diagnosis of that type of subnormal mentality which requires institutional care. That is, the two tests most differential of the Fort Wayne group were only seventh and ninth in differentiation of the backward school children; the two tests best separating out this group were fifth and poorest in diagnosis of the institutional cases.

school children with only a slight overlapping, in the lower ten per cent of the distribution for the school population.

2. The scale places 42 out of 48 children in a class for brilliant and a class for subnormal children, in the two extreme ten per cents of the total distribution for the school children.

3. It separates nearly as accurately extreme retards and markedly accelerated children from the average group.

4. There is some evidence to show that a scale made of the five tests most differential among the ten used, would be slightly more differential of the groups above mentioned than the entire ten tests.

THE FIELD OF CLINICAL PSYCHOLOGY AS AN APPLIED SCIENCE

A SYMPOSIUM

(The three following papers were prepared for a symposium which was to be presented at the annual meeting of the newly organized American Association of Clinical Psychologists, held in Baltimore, December 28. Owing to the lateness of the hour it was necessary to omit the reading of the papers. Following the suggestion of several members, the papers are published here, without alteration, in order that the material may be made available to the members before the next meeting. J. E. W. W.)

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The purpose of this symposium is to direct discussion. It is hardly necessary to simply provoke discussion. We are dealing with a very unsettled subject; and it is rather too easy to call forth difference of opinion. Two considerations, however, are no longer in the arena of debate; first, that there is a specialty entitled to the name of clinical psychology; and secondly, that there should now be some form of organization to protect and to promote that specialty as a profession.

When, however, we bluntly raise the question, "What is clinical psychology?" consensus of opinion by no means prevails. Some persons object to the term altogether, and prefer such designations as consulting psychology and applied psychology. Both of these substitute terms, however, are more general and less descriptive. Specifically, clinical psychology is the science and art of individual mental examination and interpretation. It is rather more an art than a science, because its objective is the determination of the mental status of a subject, and the deduction of a practical conclusion as to the possibilities and limits of his improvement. A clinical psychologist is one who is qualified to make a responsible, interpretive mental diagnosis.

Clinical psychology is to be distinguished from psycho-technology. Psycho-technological work has to deal with special and more or less technical questions of methodology and procedure in the fields of industry, commerce, advertising, salesmanship and school administration. Educational psychology, the mental survey, group testing and even trade testing have more affinities with psycho-technology than with clinical psy-

chology. The latter has to do with diagnostic individual examination.

In actual practice the field of clinical psychology has usually not attempted to include individuals suffering from definite mental disease. There are sound reasons for this. There are many problems common to psychiatry and to clinical psychology, but there is also a cleavage which must be respected. There is a considerable field of psycho-pathology which legally, traditionally, administratively, and even theoretically is intimately part of the science and art of medicine. Psychiatry is a recognized branch of medicine; while clinical psychology must, as yet, be considered in the relation of an auxiliary, consultative specialty.

Important work lies ahead in bringing the medical and psychological professions into mutual association; and perhaps the organization which we contemplate may further that work. There is another field of medicine where cooperative relations remain to be established. This is in the important branch of Pediatrics. The whole pre-school period from birth registration to entrance upon school life is destined to become of increasing importance from the standpoint of public health, of public education, and of human engineering. The activities in this field at present are largely medical in their character and in their administration. Pediatrics as a division of clinical medicine or in a broader sense, as a division of public health holds tremendous possibilities. These should in some way be made to include the methods and spirit of clinical psychology. An alliance of some kind must be worked out, or there must be an increase of the type of pediatrician whose equipment includes clinical psychology.

Should not courses in mental development, clinical psychology and mental hygiene become an accepted part of a medical education, and particularly part of the training of the school physician and the pediatrician? And, should not our organization further a movement in this direction? It should be the function of the association to promote clinical psychology as well as clinical psychologists. Nothing will so widely diffuse the benefits of clincial psychology as a proper coordination with the education of medical students, of public health nurses, school nurses, and medical inspectors.

"Clinician" is one of the most respected and significant words in the domain of medicine. It will be fortunate if this word loses none of its dignity and flavor when transferred to the field of applied psychology. A good clinician, in medicine, is an expert who, without necessarily being an authority or

even an investigator in any particular phase of medicine, has so mastered the pertinent principles of his medical science that he can, in the presence of perplexing ambiguities and complications, make a shrewd estimate regarding the conditions and outlook of his patient. He can summon a large amount of previous experience to bear upon his problem. By virtue of his trained perceptions and his native good judgment he can draw a conclusion which has professional and practical value.

Clinical psychology has not yet become as refined, as exact, nor as complex as clinical medicine; but if it is to be worthy of a similar position in the field of applied science, it must protect its standards. Quackery and charlatanism should be exposed and opposed; and methods must be found for guaranteeing and certifying proficiency.

The establishment of standards is the most concrete and essential function which an American Association of Clinical Psychologists can fulfill. This fact at once raises a question in regard to our relation to the American Psychological Association. The latter association, contemporaneously with the inception of the A. A. C. P., appointed a Committee on Qualifications for Psychological Examiners and other Psychological Experts, with a Sub-committee on Certification. Certainly this creates a situation which is in need of adjustment. It is by no means an ominous situation, for practically all of the members on the committee of the A. P. A. are also charter members of the A. A. C. P. There should, however, be a prompt readjustment so that there will be no conflict or duplication of activities. One solution of the situation is to convert the impending A. A. C. P. into a sub-section of the A. P. A. The writer would prefer two discrete organizations with an official affiliation. This would preserve the close relations with the parent organization which are highly desirable, but leave sufficient freedom for prosecuting the ends for which the A. A. C. P. was designed.

Whether evidence of expertness in clinical psychology is to depend upon certification, or upon membership in the A. A. C. P. is after all mainly a matter of detail and administrative policy. We are in no way anxious to create a new academy of immortals, but our aim is to erect high standards for a branch of Applied Psychology and for a possible profession.

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One of the original Binet tests was "What happens when two people discuss a subject without understanding the words they use?" Most of us know what happens, and yet we are in great danger right now of committing the folly in spite of its known consequences.

Some of us who think we are clinical psychologists think we want an Association of Clinical Psychologists. If it were an informal affair the task would be easy — we would simply pick out the group of people we would like to have associated with us and the thing would be done. If we only wanted a neighbors' club this would do. But we are looking for something more formal, an association that would stand for something. An association to be a member of which is not only an honor but a certificate of standing. Our membership, therefore, must be based upon something more than personal preferences. Whether we organize an association of clinical psychologists or whether we organize a clinical division of the American Psychological Association in either case the members must be clinical psychologists.

What is a clinical psychologist? There is the rub — nobody knows. And nobody knows because the expression is a new one, relatively, and we have not agreed upon what we wish it to connote. The first thing to be settled, therefore, is — what do we wish the term to include? Not what does it include, because as already stated it is a new expression and includes nothing. As everybody knows *clinical* is a medical term which we are taking over into applied psychology, and since we are straining its meaning somewhat in applying it to psychology at all we can stretch it as much as we see fit and make the term mean whatever we like. It will, of course, get its meaning from the group to which it is applied.

Let us first see what it is that we are using. *Clinic* as a noun applies to "the teaching of medicine and surgery practically, at the bed-side or in the presence of patients." *Clinical* is an adjective; "of or pertaining to a sick-bed." A *clinician* "is a physician whose method of treatment, observation, etc., are being based on clinical work. One who holds clinics or whose specialty is the giving of clinical instruction." From these definitions it seems that there are three ideas comprised by the term: first, bed-side; second, sickness; third, teaching. Medical usage has already freed itself from the strict bed-side idea as witness the out-patient clinics. Also they escape more or less from the teaching idea. These same out-patient clinics

very often have nothing of the teaching side connected with them, nevertheless, the physician in his office who sees patients and examines them during office hours does not call that a clinic. The one thing that does remain is the idea of sickness. Physical examination of well people is not called a clinic.

Returning now to the psychological use of the term we know that about all that is left if we consider all the ways in which the term has been used, is the idea of personal examination. Indeed if we should ever come to call the person whose only training and experience is in giving group tests, a clinical psychologist we would have thrown away the last vestige of the original significance of the term clinical. The teaching idea does not hold. If the time ever comes when one teaches psychology by means of clinics they will undoubtedly be called psychological clinics, but that is insignificant at present. The only thing left is the sickness side. Shall we confine its usage to something that is at least analogous to sickness? or, shall we break away altogether and allow the term to be used for any mental examination? It seems to the writer that the latter procedure would be a mistake and that much of the present confusion as to what shall be the qualifications of membership in the proposed association of Clinical Psychologists arises from the extension of the term clinical psychology until it is practically synonymous with applied psychology.

Would it not simplify the whole situation if we were to agree that as related to the practice of psychology, clinical should mean personal examination of some one who is mentally abnormal, or subnormal, leaving those psychologists, who apply the science to determining what the special traits of a normal individual may fit him for, to form a separate group, possibly to be called vocational psychologists? And again those who make a specialty of applying the laws of mind to industrial efficiency to constitute another group, the industrial psychologists? Surely these are three quite different fields. The clinical psychologist as thus defined need know nothing of vocational guidance or industrial psychology, any more than a physician needs to be a clergyman or a lawyer. Or, if the illustration is better, any more than the physician need to be an expert surgeon or an oculist. If this view could be accepted it would indeed go a long way toward settling the other problems that we are facing whether the clinical psychologists will form an independent association or ask to be set off as a division of the A. P. A.

The number of clinical psychologists, under this definition, is as yet too small to warrant the establishment of a separate organization. We are too few to obtain the purposes which we

have declared as those of such an organization. Nevertheless it is highly desirable that the clinical psychologists be recognized, that standards of training and experience be established before the group becomes so large as to be unwieldly and before it includes persons that do not have qualifications that are recognized as essential. In accordance with this plan the A. P. A. might at once divide itself into at least five groups or more if needed: the pure psychologists, educational psychologists, clinical psychologists, vocational psychologists and industrial psychologists. Each of these would in time perhaps, if not at once, subdivide again; for example, clinical psychology might divide itself into perhaps three groups: those devoted to the study and diagnosis (1) of mental arrest, (2) of mental disease, and (3) of crime and delinquency. Of course these somewhat overlap and run into each other, but that is true of all specialization and only means that those who devote themselves to crime and delinquency must be clinical psychologists in a broad sense to the extent that they recognize mental disease and mental arrest. This seems like a logical development of the A. P. A.

If, on the other hand, we make the term *clinical* synonymous with *applied* and form an idependent association of clinical or applied psychologists there will inevitably be sooner or later a breaking up of the present membership of the A. P. A. into two groups. While we would attempt to keep up our intrest in both associations it would inevitably result in a division.

The result of the work of the psychologists in the war has demonstrated clearly that psychology has a practical side and the people are conscious of that fact and are going to more and more insist that psychologists help them solve their problems. This means that the field of applied psychology is as wide as human activity and we will more and more devote our knowledge of the science of mind to the practical solution of human problems. Psychology is today able to do more for human efficiency than perhaps any other science. It is possible to take a child and after a careful clinical examination make a diagnosis which in thousands of cases saves the wasted energy of years in the old trial and failure method of education and industrial activities; and yet we have made only the merest beginning. The work is destined to spread very rapidly and cover an enormous field and if done rightly and wisely will perform an enormous service to humanity.

In the nature of things, however, there will be enormous abuses. Just as the public was for years preyed upon by medical quacks and patent medicine venders, so there will be innu-

merable charlatans practicing under the name of psychologists. This is inevitable. There is probably no way to prevent it but much of the evil can be headed off by vigorous action on the part of an organization of bona fide psychologists. It would seem that the American Psychological Association with its more than a quarter of a century of work, its carefully selected membership has a tremendous advantage, in carrying out this work, over any separate organization that would be formed.

Moreover, we must not overlook the possibility of organizations in the bastard group who will go into this work purely for financial reasons, moreover there is nothing to prevent them from taking high sounding names that will attract the public and make the work of the true psychologist so much more difficult. In view of all these considerations I question whether we can at this time afford to run the risk of dividing our forces by the organization of a separate association of clinical psychologists, whether we use the term in the limited sense for which I have spoken or whether we use it in the broader sense as practically synonymous with applied psychologist. As members of a division of the A. P. A. we would all be bound together with strong *esprit de corps;* we would hold our meetings together and would have an ever increasing influence and power with the American public.

J. E. WALLACE WALLIN, Psycho-Educational Clinic and Special Schools, St. Louis.

In the field of medicine the connotation of the word "clinical" is perfectly well fixed. The clinical method refers to the direct examination of the individual patient by any or all of the approved methods of modern medical science. The aim of the examination is: first, to classify or diagnose the disorder or disease upon the basis of the etiology, which frequently can only be done by a systematic, comprehensive examination of the individual; second, to prescribe a course of curative treatment; and, third, to make a prediction of the probable outcome of the treatment and the future course of the malady. Of course, the physician may examine normal, healthy individuals as well as those who are ill, but in practice the time of the vast majority of medical men is given to the examination and treatment of the diseased and disabled. At the present time we note a growing tendency to place the chief emphasis upon the preventive aspect of medicine, and the interest in preventive medicine has already led to the development of a new profession, and the establishment of a new degree, the Doctor of Public Health. This type of doctor is not primarily, if at all,

engaged in the work of clinical examination, but is concerned with maintaining the public health by the control and regulation of the sanitary agencies affecting the well being of the entire community.

To prepare competent clinical practitioners the medical schools have established courses of instruction only part of which are clinical in nature, but all of which serve to prepare the student for the strictly clinical branches in the upper years of the course. The degree of M. D. is not conferred upon anyone who has not completed all of the preparatory and clinical courses. In addition eight medical schools now require at least one year of clinical practice in a hospital internship before conferring the degree. No one is admitted to membership in the largest and strongest organization in the medical profession, the American Medical Association, who is not a "legally registered physician." In only a few states is it possible to register as a physician without the M. D. degree. To still further safeguard the interests of the public, no one is allowed to practice medicine who has not received a state license.

Now, I take it that the situation in clinical psychology, with reference to the significance, purpose, demands and responsibilities of psycho-clinical work, does not differ materially from the clinical situation in medicine, at least so far as concerns work with the mentally disordered or deviated. Let us now briefly emphasize a number of propositions which are germane to a consideration of the field of the clinical psychologist and the plan of organization of this Association.

First, no matter how valuable the results from group psychological tests may be for the relative rating of the members of a group or for securing preliminary data, it is questionable whether we are justified in considering group testing as clinical testing, and classifying group testers as clinical examiners. The clinical examiner may employ group tests, but he is not a clinical examiner unless he analyzes (or diagnoses) each case on the basis of an individual examination. A clinical examination in psychology, as in medicine, always means an individual examination of a subject.

Second, the field of clinical psychology in the past has, in practice, been largely restricted to the examination of mentally deficient, backward and delinquent subjects, and possibly the psychotic, although the workers among the insane have usually not classed themselves as clinical psychologists. Theoretically, however, the field of clinical psychology is coextensive with the field of individual psychological examination. The clinical psychologist may devote himself to the study of the feeble-

minded, backward, normal, supernormal, the delinquent, the dependent, the pauper, the hobo, the psychotic, the specifically mentally handicapped, the applicant for vocational guidance, the person who wishes to know whether he possesses aptitude for a special craft, art or profession, the army and navy recruit, with a view to insure placement in the proper arm of the fighting forces, etc. But can we classify any investigator of these classes of individuals and of these problems, no matter how meritorious his work, as a clinical psychologist unless he utilizes the clinical method of individual examination? Testing army recruits in groups of hundreds by means of intelligence test-blanks doubtless under favorable conditions gives a fairly reliable and valuable relative intelligence rating, but such an examination is no more clinical than a class examination in geography or reading, and such a group tester is no more to be considered a clinical examiner than a teacher who conducts class tests in the school branches. When the clinical method is used, however, there is theoretically no limit to the psychological problems which may come within the scope of clinical psychology.

Third, the purpose of a clinical examination in psychology, just as in medicine, is: (a) the making of a correct diagnosis of the case, which involves the elaboration of a clinical picture of the mental conditions found at the time of the examination, and the detection of the etiological factors responsible for the ascertained mental deviations; (b) the rendering of the advice, or the prescription of the educational and social treatment which is indicated by the diagnosis, together with the reinforcement of recommendations for physical treatment made by competent medical examiners; and (c) the making of a reliable prognosis, so that the treatment or training may be effectively directed toward the best development of the individual. Whoever fails to realize all of these aims only partially performs the functions of a clinical psychologist. Whoever has been trained to do less than this, has been inadequately trained for clinical work in psychology. Certainly so far as concerns the mentally pathological or abnormal or anormal classes, the clinical psychologist, just like the physician, must deal with etiological factors and not merely with symptoms. Just as the physiologist or the anatomist, no matter how much he may know about the human body, is not a physician because he does not employ the complete clinical procedure, in the use of which he has no special fitness, so the general, experimental, educational, or physiological psychologist is not a clinical psychologist, no matter how much he may know about the mind, unless he has

been specially trained to use the clinical procedure. Therefore—

Fourth, to become a competent clinical psychologist, just as to become a competent examining physician, requires a course of special training. A course of training in the ordinary branches of psychology which is entirely adequate to produce a good teacher or investigator in those branches is not sufficient to produce an efficient clinical examiner in psychology. But the training needed in addition to the basic psychological, biological and scientific training will differ according to the field in which the clinical psychologist is engaged, and will have to be gradually determined by the consensus of opinion of the workers engaged in each specialized field. The strictly professional training — *i. e.*, the training beyond the basic psychological and scientific training — which will qualify a psychologist for skilled work among the psychotic, will not qualify him to diagnose and direct the educational treatment of feeble-minded, backward, speech defective, alexia — or dyslexia — or merely pedagogically handicapped school children. Nor will the training which qualifies one for efficient work among these types of handicapped school children produce an expert on the selection of successful salesman or on the proper placement of army recruits, or on the direction of courses of instruction for supernormal children. The different fields of clinical psychology have their own special and unique problems, the proper handling of which requires special study and skill in the particular field concerned. Doubtless the technical differentiation of psychological specialists will so develop that in future we shall have some psychologists who will specialize on feeble-minded children and adults, others will specialize on backward and specifically handicapped school children, others on delinquents, others on bright and talented children, others on the selection of employes, etc.

This is not the place in which to attempt to outline the kind of differential training which clinical psychologists working in different fields should have. But we may indicate briefly, by way of illustration, the training which we believe workers must have who would render skilled service in the psychological examination of mentally and educationally handicapped school children, and in the supervision of educational work in their behalf.[1]

[1] For a further discussion of this question, see our article on The Field of the Clinical Psychologist and the Kind of Training Needed by the Psychological Examiner of Mentally and Educationally Deviating School Children. *School and Society*, 1919, p. —. See also *The Mental Health of the School Child*, 1914, pp. 114f, 134, 136, 210, 216f.

1. The basic training in the various branches of psychology.

2. Special training in clinical psychology, including training in the administration of the current tests used in individual examination, the practical clinical examination and the working up of case reports of at least 200 cases, in course, and preferably a post-doctorial year in a position corresponding to a medical internship, in which studies would be made of various types of deviating children, especially the feeble-minded, backward, epileptic and psychotic.

3. Various pedagogical courses, particularly courses on standardized educational tests; on primary methods of teaching, especially the teaching of reading, spelling and number, and the kindergarten and sensori-motor exercises; on the psychology and pedagogy of the feeble-minded, backward, and speech defective, and children with specific sensory defects, particularly visual and auditory, and with specific defects in reading, writing, spelling and number; and practical courses in the various types of handwork which should be offered mental retardates.

4. Social pathology, including a study of the social, vocational and criminal aspects of mental deficiency and defect.

5. A minimum amount of medical training, in order that the clinical psychologist may secure proper perspective in the work and be able properly to interpret the medical reports, including courses in physical diagnosis, pediatrics, orthopedics, ear, nose and throat disorders, mental deficiency from the physical point of view, neurology and psychiatry, and practical case writing, including the study of the subject's developmental and family history.

It must be quite evident that while the above course of training would qualify a psychologist for skilled service with educational deviates — and we doubt that a less thorough course would do this [2] — it would not qualify him for expert service in many other fields of clinical psychology. We doubt that anyone would propose the above course of instruction in its entirety for a student who was preparing to make psychological studies among the insane, or who was qualifying as an expert on trade tests or on the selection of salesmen.

Fifth, owing to the important practical bearings of clinical work in psychology, only those should be accorded official or

[2] How far the psychological examiners in the public schools of the country fall short of a lower standard of preparation than the one suggested above, was indicated by the study of our questionnaire returns from 302 cities in 1913. In our judgment only about 25% of 115 psychological examiners at that time were qualified for the work. Cf. *The Mental Health of the School Child*, 1914, 392f.

professional recognition as clinical psychologists who have been adequately prepared. The organization of an association or associations, with rigid eligibility requirements, will do much to bring about the proper training of examiners and secure for them the recognition to which their professional qualifications entitle them.

If the above conclusions are correct, the following corollaries would seem to follow. We do not submit them in a dogmatic spirit, but rather as suggestions which we think should be adequately considered before a constitution is adopted by this Association.

First, no one should be eligible for membership in the American Association of Clinical Psychologists unless he is at the time of election holding a position in which he is regularly devoting at least a portion of his time to actual psycho-clinical examinations, or unless he has in the past devoted a considerable portion of his time to genuine clinical work. Possibly it were wise to make an exception in the case of teachers who are training students in mental testing and of research workers who are perfecting and standardizing psychological tests which will be of value in individual examinations. It is evident, however, that teachers will not be especially qualified to train the students in the art of clinical diagnosis and treatment, which involves more than training the students to administer psychological tests, unless they have had actual, first-hand clinical experience and are devoting some of their time to clinical examination. And yet we must recognize, from what has already been said, that the necessity of having clinical experience and doing clinical work, will vary with the type of problem.

Second, no one should be eligible for membership who has not taken the Ph. D. degree in the various branches of psychology in an institution of recognized standing; and who has not published or prepared for publication a valuable contribution in the field of mental tests or clinical psychology.

To this condition it is probably advisable to make one exception: a holder of an M. D. degree may be admitted if he has had special training in psychology and considerable experience in making individual psychological examinations and diagnoses, and if he has made valuable contributions in the field of mental tests and clinical psychology.

The suggestion has been made that the rank of associate membership be established for psychological technicians or testers who cannot qualify under the above conditions. We are inclined to doubt the advisability of this suggestion. One of the chief aims of the Association should be to develop the

highest standards of work in the field of clinical psychology, in order that properly trained clinical psychologists may secure the emoluments and recognition to which their special preparation and fitness entitle them. We shall probably secure a large number of applications for membership from persons who wish to profit by the prestige which membership will confer who should not be given this recognition if their basic and professional training and experience are inadequate. In this connection, however, we may raise the question whether it would not be advisable to call the members of the Association Fellows rather than Members.

Third, in addition to the above two general conditions, a candidate to be eligible for membership must have secured a special or technical preparation in addition to the basic work in experimental, educational and other branches of psychology. This strictly technical preparation, however, would have to differ, as we have already stated, according to the particular field in which the psychological examiner is engaged. If this is so, it is impossible to outline the detailed professional training which a candidate for membership must have, unless the Association is divided into sections. Every section would then have to determine upon the necessary technical training needed for membership in its own section. Under such an arrangement every candidate would have to meet two requirements: first, the general conditions for membership imposed by the association at large — say, the first two conditions given above — and second, the special conditions required by the individual section. If this plan were approved, we should probably have the following sections: Mental Deviation, including mental retardation and deficiency and possibly specific mental deviations; Mental Disorder, dealing with various grades and types of psychotic disorders; Crime and Delinquency; and Trade and Vocational Testing. Other sections would eventually emerge as the problems become more clearly defined, because the progress of the science will doubtless be toward greater and greater differentiation of special fields. The American Medical Association now has 16 sections in its Scientific Assembly, and in addition five councils which make recommendations in the interest of physicians.

One of the practical arguments for establishing the sections is that this will make it possible to more fully realize the aims of the association to establish high standards of professional qualifications for clinical examiners in psychology. According to the plan of organization as at present proposed, it is impossible to define satisfactorily the strictly technical qualifica-

tions which a clinical psychologist should possess in order that he may be rated as proficient or in order that he may be eligible for membership, because the requirements which are applicable to one type of examiner are not applicable to another type. The Association already has in its membership persons who should be distributed in several sections, while applications in future will no doubt come from persons representing very diverse interests. Recently a western state adopted a statute according to which no one can be appointed as a clinical psychologist to one of its state institutions for the feeble-minded who is not a member of the American Psychological Association. But the majority of members of that Association have not made any technical study of feeble-mindedness at all, so that the fact that one is a member of this Association does not constitute him an expert on feeble-minded children. But the same criticism applies also to this Association. Membership in this Association, according to the present plan, does not indicate whether the person is qualified to do work with feeble-minded or backward school children, or with the insane, or the delinquent or the normal, or any other class. The establishment of a number of sections, with membership limited to the experts in the particular field of each section, in accordance with the present practice of the American Medical Association, would have the merit of indicating the particular specialty of each member. Would it be worth while to divide the Association up into sections to gain this advantage? I believe that it would. But there may be weighty practical objections to sectionalizing the membership. The aim of the writer is merely to offer the suggestion, in order that the whole matter may be fully considered before final action is taken.

If the suggestion were adopted, however, the Association could adopt the general conditions for membership at this meeting, while the specific technical qualifications would have to be worked out by committees of the various sections which would be authorized. These committees would report their recommendations to the individual sections for adoption at the next annual meeting. No new members ought to be elected until the sections had determined upon their eligibility requirements.

A further suggestion has been made that the title of the Association be changed to the American Association of Consulting Psychologists, or the American Association of Applied Psychologists, and that sections be established to include all the important applied divisions of psychology. The scope of such an Association would be broader than that contemplated by the present Association, as non-clinical workers would

evidently be eligible for membership. If eligibility to membership in the Association of Clinical Psychologists will be limited to persons who are engaged in genuine clinical work, at least on a part-time schedule, or have been thus engaged, this expansion of the Association is probably not advisable. But if eligibility will not be so limited, it would seem to the writer that either of the other two titles will more correctly express the scope and purpose of the Association.

BOOK REVIEWS

PAUL POPENOE and ROSWELL H. JOHNSON. *Applied Eugenics.* The MacMillan Company, New York, 1918. p. 443.

This book, while bound to provoke vehement discussion, is as surely bound to afford no small amount of satisfaction to those who have felt acutely the want of a thorough-going treatment of the principles and program of the eugenic movement, since gross misunderstanding and misuse of the term Eugenics still persists.

For the first time we are in possession of a balanced study of adequate length, which escapes being a primer or a profoundly technical volume. It is greatly worth the waiting for.

The lay reader will be impressed with the incisive refutation of popular confused assumptions involved in the old debate upon the relative importance of heredity and environment. The lines of evidence, statistical and experimental, indicating that differences in a trait are more affected by differences in nature than by differences in nurture, are drawn from the Galton, Thorndike, and Pearson investigations and from the researches in families of distinguished persons made by Woods and Cattell. The latter's study, however, only indirectly proves the author's point in that it serves to call attention to the complex interrelation of environmental factors operating upon traits inherent in original nature.

A discriminating analysis of the problem of germ plasm modifiability is provided. Current misconceptions concerning the transmission of characters are summarized and the actual significance of data traditionally alleged to show it is thoroughly pointed out.

Contemporary psychologists and biologists need no new treatise on the distinction between the conditions affecting germ plasm and soma plasm or upon the capacity of natural selection to account for progressive and retrogressive changes in the race. What we did need was an authoritative and at the same time readable presentation of the facts for non-scientific persons, many of whom, though academically trained, are still advocating as *eugenic* various agencies on the false supposition of their fundamental power for racial betterment. This need is met in a book likely to surprise, inform, and convince such individuals if they can be induced to read it.

Furthermore the doctrine regarding "racial poisons" is still tenaciously held by many sociologists, social workers, psychiatrists, and clinical psychologists, unaware of the recent results obtained through close laboratory scrutiny of the subject. These students fall into two classes: those unconscious of the fact that the influence of alcohol, for example, upon the mechanism of heredity is a matter even open to discussion (as two persons who are regarded as experts in the field of social science recently confessed their ignorance to the reviewer); and those who, aware that it is questioned, resent what they deem audacious and preposterous attempts to minimize the baneful effects of alcohol upon the mind and body.

The authors give a critical resumé of the evidence on both sides of the controversy. They further augment the weight of the argument against transmission of acquired characteristics by an admirable crit-

ique of the time-honored belief in prenatal culture. In emphasizing the conclusion that eugenics is obliged to concern itself solely with the material in the germ plasm which cannot be permanently modified by external influences, and that hence the only means to race betterment is through changing the birth and death rates to alter the relative proportions of good and bad germ plasm in the race, the authors are by no means scornful of Euthenics. It is to be expected that they will be wrathfully accused by superficial readers of denying the good accruing to the individual and society through all the reform movements of the day, in spite of numerous explicit statements such as this: "Eugenics . . . is inadequate unless accompanied by constant improvement in the surroundings; and its advocates must demand euthenics as an accompaniment of selection, in order that the opportunity for getting a fair selection may be as free as possible."

The chapters dealing with mental differences and inheritance of mental capacities are well handled from the standpoint of a disciple of the Thorndike school upon whose work the authors draw heavily.

Although their resumé of the literature dealing with the comparison of the white with the negro races is excellent, psychologists will be quick to note the omission of reference to Woodworth's and Bruner's work on *Racial Differences in Mental Traits* and Thorndike's penetrating valuation of the facts. The desirability and possibility of enforcing restriction on marriage and parenthood among the dysgenic classes is argued on biological, humanitarian, and economic grounds. Legislation of genuine eugenic value would be segregation, differently drafted sterilization and divorce laws, and repeal of laws prohibiting marriage between cousins.

In the chapter on Improvement of Sexual Selection the authors state what they call the psychological point of view in support of the claim that eugenic ideals can become a part of the habits and "conscience" of the race and the selection of life partners unconsciously influenced. The authority cited for this belief appears to be Galton alone. Watson's advocacy of experimental study in the control of emotions and the application of the theory of the "conditioned reflex" as a means of reaching such an end has been overlooked.

One of the features of the book which bears the distinction of original contribution is the chapter pointing out the eugenic aspects of certain specific laws, movements, and reforms, e. g., Democracy, Socialism, Feminism, child labor, compulsory education, vocational guidance, minimum wage, trades unionism, housing, pensions, taxation, prohibition, *et cetera*. The authors are not guilty of sweepingly branding these features of society eugenic or dysgenic, but cogently set forth their direct and indirect influences in respect to ultimate racial improvement through increase and decrease in relative proportion of superior and inferior strains in the population. The conclusions reached through adroit reasoning are perhaps more often unexpected than not.

Any consideration of dysgenic effects of social amelioration must take into account that we do not know what the trend of variation in human beings is nor how natural selection is operating. On the other hand, conditions entailing a desirable high death rate of inferiors may at the same time prove unwholesome to the superiors as well and even actually create inferior variations unaware. Until we have experiments showing what environmental forces are the causes of variability we cannot hope unerringly to determine and eliminate the true sources of deterioration.

There are certain infelicities of diction and noticeable typographical errors, but it is none the less an admirable specimen of book-making. The interest of the discussion is enhanced by copious and effective illustration.

Smith College. MIRIAM C. GOULD.

HELEN MAROT. *Creative Impulse in Industry, A Proposition for Educators.* E. P. Dutton & Company, New York, 1918, p. 146.

This book, which carries the significant sub-title, "A Proposition for Educators," is dedicated to "Caroline Pratt whose appreciation of educational factors in the play world of children, intensified for the author the significance of the growth processes in industrial and adult life." The author analyzes the industrial system in this country and by contrasting it with the German system points out its inherent weaknesses as well as the means of remedying them. "America wants industrial efficiency, it must have efficient workers if it holds its place among nations, and American people will prove their efficiency or their inefficiency as they are capable of using the heritage which industrial evolution has given the world. But what shall we use this efficiency for? For the sake of the heritage? For the sake of business? For the sake of Empire?"

Among the chief weaknesses of our present industrial system, according to the author, are the facts that we value possession of wealth more than its creation, that both capital and labor are interested in the exploitation of wealth rather than in its production. Consequently the manufacturers value the workmen merely as so many attachments to their machines which they would like to standardize, perhaps, by an industrial education, just as the other manufacturing processes have been placed on the highest basis of efficiency as measured by mass production. The monotony in labor brought about by thus dividing "the workers into eyes, arms, fingers, legs, the plucking out of some one of his faculties and discarding the rest of the man as valueless," his ignorance of the complete process of production, of the finished product and its final marketing, have produced in the laborer not only a mental state of indifference to his work but also a disinclination to produce, which in the long run may offset such artificial stimulants and inducements to higher efficiency as better wages, comfortable and safer working conditions, means of self-improvement, and selection for positions and advancement to better positions on the basis of greater fitness. It would be useless to revert to and repeat the experiences of craftmanship and the Guilds of an earlier age, since our present state of society has evolved from it. Other suggestions for correcting the evils of our present system are not promising, since they fail to appeal to the worker's impulse of creativeness. The author then goes into some detail, in the second chapter, to show how only partially successful in this respect the efforts of scientific management have been except in so far as they incidentally and accidentally involved this impulse. Another chapter is devoted to the attempt at showing that the German paternal system of industrialism for the glory of the empire would be absolutely impossible for the American people, even if greatly modified and in spite of our recent favorable experiences in governmental control for the purposes of carrying on the war.

The author's own positive suggestions for remedying the most seri-

ous evil of our present industrial system consist in demonstrating the possibilities for developing a socialized productiveness in the workers, by utilizing or appealing to their "orginating, choosing, adapting power." She says, "the creative effort is not *necessarily* an individual matter. It may be possible for a group of people to associate cordially and freely together with a single creative purpose and endeavor. It may be possible for each worker to experience the joy of creative work as he takes part with others in the planning of the work along with the labor of fabrication. It is a creative experience or dull labor as his association with others in the solution of the problem is freely pursued and genuine, or as it is forced and perfunctory" (p. 137). In this connection the author describes in some detail the educational experiment carried on by Caroline Pratt in New York City under the auspices of The Bureau of Educational Experiments, 16 West 18th Street. Miss Caroline Pratt, with the help of several adults, is conducting a Toy Shop with about forty pupils between 14 and 17 years of age. The pupils have here an opportunity to become familiar with all the technical, financial, administrative, economic, aesthetic and literary processes involved in the production of marketable toys for American children. The practical value of such an educational experiment will depend upon the answers that it can make to such questions as "(1) Was the creative impulse aroused? (2) Were standards of workmanship discovered and sustained? (3) Was a broad as well as a working knowledge of subject matter acquired? (4) Did the children approach established methods in a spirit of hospitality and of inquiry as to their validity? (5) Did the problems create sufficient interest to arouse the desire and will to reject faulty methods, and introduce others of greater service? (6) Was the enterprise a productive one from the point of view of the market and an educational one from the point of view of growth?" (p. 133).

The author recommends that educators cooperate with engineers and architects and the managers of industry in proposing a new program or system of production. She believes that "engineers, not under the influence of business, are qualified to open up the creative aspects of production to the workers and to convince them through their own experience that there are adventurous possibilities in industry outside the meager offerings of pay-day" (p. 109). She names Mr. Robert Wolf as one of the engineers who is ready for the adventure. In working out such a program "it will be the mission of educators to show that by opening up the field for creative purpose, fervor for industrial enterprise and good workmanship may be realized, that only as the contents of industry in its administration as well as in the technique of its processes is opened up for experiment and first-hand experience, will a universal impulse for work be awakened" (p. xx).

Whether it may be granted or not that the book correctly diagnoses our present industrial defects, it fails to combat the employers' claim "that from 95 to 99 per cent of the working force is without productive impulse" (p. 134) by the only convincing argument to the contrary, the experimental demonstration of the universality of a creative impulse in human nature. In this respect the author's mere assumption of its existence is psychologically as unfounded as Veblen's assumption of an instinct of workmanship. To recommend sweeping educational and industrial changes on the basis of a new sociological hypothesis, because our present industrial system is faulty, amounts to suggesting the haphazard methods of trial and error instead of the

much slower but surer way of first establishing the psychological facts upon which the new sociological hypothesis must ultimately rest.

L. R. G.

ALICE MINNIE HERTS HENIGER. *The Kingdom of The Child.* (With an Introduction by G. Stanley Hall.) E. P. Dutton & Company, New York, 1918, p. 173.

In her latest volume, Mrs. Heniger presents the psychological conclusions which her fifteen years' work with the Children's Educational Theatre have enabled her to draw, and shows how they may be used as fundamental principles of modern pedagogy. The child's kingdom is the world of imagination, of make-believe, is her main thesis, and we must use this innate creative instinct in order to breathe the glow of life into our deadly school curriculum, and also to mold the character and shape the personality of the children intrusted to our guidance. The vital mistake we have made as parents and teachers is our failure to recogize this basic tendency of childhood, as a result of which we have forced our children to repress their impulses toward self-expression, and made them become servile imitators of us, as adults too blind to see the longings and aspirations of their prisoned souls.

Mrs. Heniger gives numerous examples which illustrate her point more clearly than any abstract discussion could ever hope to do. She cites cases of retarded children, with whom the ordinary school methods have failed, and tells how, under the benign influence of the Educational Theatre, their lives have grown fuller and richer in their strivings to interpret the characters assigned to them, so that the long denied promotion becomes an indirect result of this release of their inner life. She describes the months of arduous study put in by a little slum girl who wished to be able to play the part of a fashionable boarding school miss in "The Little Princess," and pertinently inquires whether any other motive could have induced her to work so eagerly to acquire the traits of personality and social grace of a type far outside her personal experience. For these children, starved by their environment, seek to enter another world vicariously through the gates of dramatic representation; they live the parts they play,—indeed, they must become the person in the story before they can hope to portray the character with any degree of success. Herein we have one solution of the problem of Americanizing our immigrant children; we have only to make them enter into the spirit of our great men,—as one little Russian lad did in his rendition of Lincoln's Gettysburg address,—to produce more loyal citizens than could be obtained by any amount of drill upon the Declaration of Independence as a mere rote memory lesson. It is only as they can enter into the lives of the men who created that glorious document, it is only as they, too, can feel the thrill of freedom and justice, that these foreign-born youngsters are made an integral part of our national life.

In like manner, the subjects we wish to teach our children must become humanized, and must present to the child a many-sided contact with the great racial history of mankind. Literature lends itself particularly well to this interpretation, for under skillful guidance, the child enters into the soul of the heroes and heroines of whom he reads, and unconsciously strives to emulate their noble thoughts and lofty idealism. It is in the adolescent age of the high school and college that we see the student most affected by these inspiring ex-

amples; but even the tedious task of learning to read may be made easy and pleasant if the teacher be wise enough to make the cat a real cat, and the dog a barking, tail-wagging animal of daily acquaintance.

The Sunday School comes in for its share of censorship, and numerous anecdotes are quoted to illustrate the hopeless inefficiency of well-meaning but unintelligent teachers, with their precise but uninspiring presentation of facts. It is worth while to repeat one of these examples, for it drives the point home as nothing else could do. "The story was recounted to me," writes Mrs. Heniger, "of one such lady who thought it would be appealing and helpful to tell her class the story of Adam and Eve in her own language. She had read somewhere about childhood's ready grasp of the objective lesson, so she decided to cut the story down to what she considered the level of the child's understanding. She was greatly pleased with her apparent success inasmuch as the class . . . listened attentively to her recital. But here is the way the brightest lad in the class recounted the story to a number of young friends. I repeat his language verbatim: 'There was two of 'em, and they ate off the wrong tree, and the snake told on 'em, and he said *she* made me do it, and so God said you both go to Hell!'" After driving home her argument by an anthology of these childish observations, the author pleads for an interpretation of the bible which shall bring out all its mystic beauty and allegorical significance, and pleads for the utilization of the dramatic element in the Sunday School, emphasizing the value of biblical plays for the childish actors.

While these details serve to show the style of the book, and the methods which it advocates, they can give no clear idea of the author's keen insight and breadth of vision. The scope of the work is partially indicated by the elaborate chapter headings: What Is the Kingdom of the Child and How Does the Adult Transgress in the Kingdom; How Can the Parent and the Teacher Enter with the Little Child into His Kingdom; Shall Parent and Teacher Be Subjects in the Kingdom of the Older Child or Shall They Be Rulers Therein; In the Kingdom the Child Can Learn Best How to Know Himself by Being for a Time, Someone Else, but He Must Create Not Imitate, His New Character; In Every Child within the Kingdom Slumbers the Whole Experience of the Race and We, as Educators, Must Endow the New Spiritual Lives with Form and with Substance; How the Foreign-Born Child Is Brought into the Kingdom and Remains Forever After a Loyal Subject Therein; Learning to Read Is Never Dull and Tiresome when the Schoolroom Is a Part of the Kingdom; All the Great Heroes and Heroines of Literature Reside in the Kingdom where Children and Young People Crave to Be Their Daily Companions, to Live with Them in Their Homes and to Interpret Their Thoughts; In the Kingdom, Literature is Regarded as an Expression of Our Common Humanity and Speech Is the Direct Medium from Soul to Soul; The People Who, in Books, Seem to Be dead and Buried, Are All Alive when We Meet Them in the Kingdom; In the Bible Are Page after Page of Attractive Stories that Contain Guiding Lessons of Life; In the Kingdom, Bible Stories Are Shown as The Wonderful Symbolic Allegories They Are, and Which Children's Pure Aspiring, Spiritual Imagination Really Imagines Them to Be; The Kingdom's Domain Stretches Beyond the Walls of the University, so that even a Staid College Professor May be a Dweller in the Kingdom if He Has a Mind to; The Real Kingdom Will Have a Children's Theatre

Where Good Plays Suitable for Children to See May Be Enjoyed; In the Kingdom a Little Child Shall Lead Us.

In his introduction to the present volume by Mrs. Heniger, G. Stanley Hall characterizes it as "a real and original contribution to both educational methods and our knowledge of childhood." He might well have added that it is a book which should be in the hands and minds of every mother and teacher, for it contains information which is vital for the proper development of the child's social and moral nature.

PHYLLIS BLANCHARD.

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